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V. *On the Periodic and Non-periodic Variations of the Temperature at Toronto in Canada, from 1841 to 1852 inclusive.* By Colonel EDWARD SABINE, of the Royal Artillery, Treas. and V.P.R.S.

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THE interest with which the comparison of the contemporaneous non-periodic variations of the temperature in Europe and America is regarded by meteorologists of great reputation, leads me to hope that the present communication may not be unacceptable to the Royal Society. The geographical situation of Toronto, both as respects latitude and inland position, renders it a very suitable locality for such comparison with stations in the middle parts of Europe, where similar observations have been made and where the conclusions to be derived from them are the subjects of active investigation. The years over which the observations at Toronto extended, 1841 to 1852 inclusive, were years of unusual meteorological activity in Europe; and the period of twelve years embraced by them is one of sufficient duration to supply a fair basis for generalisation on many of the problems which are now receiving the attention of meteorologists.

The observations at Toronto were made at the Magnetical and Meteorological Observatory at that station, by the detachment of the Royal Artillery by whom the duties of the observatory were carried on, and were under the direction of Captain RIDDELL, R.A., at the commencement of the observations, of Captain YOUNGHUSBAND, R.A., from February 1841 to the end of 1844, and of Captain LEFROY, R.A., from 1845 to 1852 inclusive. The latitude of the observatory is $43^{\circ} 39' 6''$ N., and its longitude $79^{\circ} 21' 5''$ west of Greenwich; the height above the surface of Lake Ontario is 108 feet, and above the Ocean about 342 feet.

From 1841 to 1844 inclusive, the thermometer was stationed beneath a roof on the outside of the north wall of the observatory. The height of the roof above the ground was about 7 feet, and three of the sides of the space which it covered (the observatory wall being the fourth side) were closed in by venetian-blind shutters descending from the roof to within 4 feet of the ground. The slope of the blinds of the shutters was such as to admit a free current of air whilst it completely screened the thermometer from rain. The shutters and the wall were coloured green, and the ground beneath was a grass-plat. The thermometer was fastened to two narrow strips of wood running horizontally from side to side of the thermometer shed, the ball being perfectly free, and about 6 inches higher than the bottom of the venetian blinds. The thermometer was read from the inside of the observatory through a

double window; its distance from the outer window being about 8 or 9 inches. From January 1845 to the end of 1852, the thermometer shed had the additional protection of a second roof and a second enclosure of venetian blinds on three of the sides, similar to those already described, and exterior to them at an interval of space from one to one and a half foot. The length of the exterior shutter on the northern side was 7 feet, and on the east and west sides 5 feet $4\frac{1}{2}$ inches. The thermometer was suspended as before with the ball perfectly free, and was read from the inside of the observatory through a window furnished with a sliding wooden shutter, which was kept closed, except at the times required for observation.

The same thermometer was employed throughout the whole period, excepting from March to December 1845, and in some few other occasional instances, in all of which corrections carefully ascertained were applied to give the values which would have been read by the thermometer usually employed. A comparison of this thermometer with a standard thermometer by FASTRÉ of Paris, was made at all natural temperatures between April 1851 and February 1852, partly with the assistance of a telescope, and partly with the eye alone. The differences between the two thermometers at the several parts of the scale have been applied to all the observed temperatures before they were combined in the Table given in this paper. The standard thermometer by FASTRÉ is divided à l'échelle arbitraire according to the method of REGNAULT. The zero-points were determined as follows:—

	0° Cent.	100° Cent.	For 1° Cent.
1851. Data furnished by M. FASTRÉ	115·7	617·70	5·012
1851. By M. IZARD and Capt. LEFROY at Paris	115·5	617·60	5·026

Re-examination at Toronto in 1852.

Freezing-point.		Boiling-point.		
			Barom. mm.	
January 13.	116·12	January 5.	614·60	743·055
14.	116·00	12.	616·55	755·136
22.	116·30	13.	614·00	740·866
28.	116·22*	28.	614·10	738·530
28.	116·10†			
				212° FAHR.=617·72
	116·14=32° FAHR.			

whence 1° Cent.=5·0158; and 1° FAHR.=2·7865 divisions.

This last value has been employed in the comparison in preference to the original determination at Paris, from which however the difference is extremely slight.

During six years, *i. e.* from July 1, 1842 to June 30, 1848, the observations were made hourly,—Sundays, Christmas Days, and Good Fridays excepted, on which days no observations whatsoever were made. In the remaining six years, *i. e.* from January 1, 1841 to June 30, 1842, and from July 1, 1848 to December 31, 1852, the

* Before boiling.

† After boiling.

same system was preserved in respect to *days*, but the *hours* of observation were less frequent. The series may consequently be divided into two portions, of which the first, or that containing the six years of hourly observation, will be first discussed.

The following Table exhibits the mean temperature at every hour in the different months on the average of the six years.

TABLE I.

Mean Temperature of the Air at Toronto, obtained by hourly observations from July 1, 1842 to June 30, 1848.

Toronto astronomical time.	Months.												Hourly means.
	Jan.	Feb.	March.	April.	May.	June	July.	August.	Sept.	October.	Nov.	Dec.	
Hours.													
0.	27·83	27·07	34·00	47·53	58·80	66·55	72·85	72·30	63·52	49·50	39·57	29·93	49·12
1.	28·33	27·93	34·65	48·47	59·72	67·28	73·77	73·07	64·12	49·93	39·97	30·65	49·82
2.	28·60	28·33	35·22	48·85	60·07	67·70	74·62	73·65	64·52	50·28	40·05	30·80	50·22
3.	28·57	28·32	35·02	48·92	60·13	68·08	74·82	74·00	64·55	50·05	39·88	30·55	50·24
4.	28·05	27·77	34·55	48·53	60·08	68·32	74·83	73·85	64·33	49·32	38·98	29·90	49·88
5.	27·05	26·57	33·80	47·80	59·70	67·72	74·37	73·30	63·37	47·57	37·77	28·95	49·00
6.	26·23	25·12	32·12	46·00	57·95	66·42	72·93	71·40	60·70	45·52	36·95	28·25	47·47
7.	25·70	24·13	30·65	43·47	55·08	63·68	69·45	67·42	58·00	44·42	36·38	27·92	45·52
8.	25·38	23·28	29·68	41·88	52·37	60·38	65·25	64·50	56·72	43·68	36·07	27·53	43·89
9.	25·18	22·63	28·68	40·80	50·62	58·22	62·88	62·92	55·68	42·92	35·78	27·28	42·80
10.	24·80	22·08	28·03	40·03	49·65	56·88	61·65	61·90	54·62	42·17	35·43	26·98	42·02
11.	24·48	21·57	27·38	39·53	48·73	55·92	60·47	61·10	53·98	41·50	35·08	26·87	41·38
12.	23·80	21·45	27·33	39·37	47·88	55·37	59·45	60·30	53·63	40·95	34·42	26·53	40·87
13.	23·33	21·07	26·85	38·62	47·02	54·68	58·58	59·65	53·02	40·35	34·13	25·95	40·27
14.	23·25	20·73	26·47	37·95	46·18	53·98	58·02	58·97	52·43	40·03	33·85	25·58	39·79
15.	23·10	20·30	26·18	37·75	45·47	53·20	57·30	58·30	51·97	39·87	33·53	25·45	39·37
16.	23·00	20·00	25·80	37·32	45·00	52·63	56·67	57·92	51·38	39·57	33·37	25·42	39·01
17.	22·82	19·65	25·28	36·95	45·05	52·82	56·62	57·73	50·75	39·40	33·48	25·40	38·83
18.	23·55	19·08	25·00	37·08	47·50	55·47	59·83	59·18	51·43	39·62	33·75	24·98	39·71
19.	23·45	18·95	25·87	39·37	50·48	58·28	63·50	62·15	53·98	40·37	33·75	24·82	41·25
20.	23·68	19·97	27·85	41·62	52·70	60·62	66·10	65·42	56·73	42·62	34·80	25·25	43·11
21.	24·65	22·27	30·02	43·60	55·02	62·50	68·30	67·92	59·15	45·30	36·33	26·43	45·12
22.	25·88	24·28	31·75	45·12	56·72	64·17	70·00	69·90	61·12	47·23	37·77	27·88	46·82
23.	27·05	25·87	32·98	46·50	57·85	65·45	71·55	71·35	62·55	48·60	38·78	29·12	48·14
Monthly means.	25·32	23·27	29·80	42·63	52·91	60·68	65·99	65·76	57·59	44·20	36·24	27·44	44·32

The hourly observations from which this Table is formed will be found in full in the volumes of the Magnetical and Meteorological Observations at the British Colonial Observatories, of which Toronto was one.

The temperature at any hour, and on any day of the year, corresponding to the mean values obtained in the six years and shown in Table I., may be computed from them by means of BESSEL's well-known interpolation-formula*, which may be thus written for the purpose:—

$$\begin{aligned}
 t_x = & A_0 + A_1 \cos a + B_1 \sin a + A_2 \cos 2a + B_2 \sin 2a \\
 & + A_3 \cos 3a + B_3 \sin 3a + A_4 \cos 4a + B_4 \sin 4a \\
 & + A_5 \cos 5a + B_5 \sin 5a + A_6 \cos 6a,
 \end{aligned}$$

* Astron. Nach. No. 136.

in which t_x is the temperature on x the required day, A_0 the mean temperature of the year at the hour required, $a = n \times 30^\circ$, n denoting the number of months and parts of a month between January 15 and x , and $A_1, A_2, \dots, A_6, B_1, B_2, \dots, B_6$, constants derived from the values in Table I. by the method of least squares.

The constants for each of the hours, and for the mean temperature, derived from the six years of hourly observation, are as follows:—

TABLE II.

Constants for the calculation of the Temperature on the several Days and Hours from the Mean Monthly Values in six years.

Toronto astrono- mical time.	A_0 .	A_1 .	B_1 .	A_2 .	B_2 .	A_3 .	B_3 .	A_4 .	B_4 .	A_5 .	B_5 .	A_6 .
Hours.												
0.	49.12	-23.38	-2.53	+0.60	+0.29	+0.62	-1.11	+0.31	+0.54	+0.25	+0.44	+0.31
1.	49.82	-23.48	-2.35	+0.65	+0.31	+0.63	-1.17	+0.30	+0.57	+0.13	+0.45	+0.27
2.	50.22	-23.65	-2.28	+0.73	+0.45	+0.55	-1.16	+0.36	+0.56	+0.09	+0.40	+0.29
3.	50.24	-23.87	-2.21	+0.85	+0.47	+0.59	-1.17	+0.35	+0.60	+0.15	+0.47	+0.25
4.	49.88	-24.23	-2.02	+1.00	+0.46	+0.68	-1.14	+0.31	+0.52	+0.16	+0.48	+0.26
5.	49.00	-24.52	-1.73	-1.17	+0.42	+0.70	-1.36	+0.20	+0.50	+0.16	+0.48	+0.35
6.	47.47	-24.10	-1.69	+1.56	-0.03	+0.48	-1.43	+0.21	+0.57	+0.27	+0.50	+0.35
7.	45.52	-22.54	-2.03	+1.46	-0.41	+0.38	-1.10	+0.23	+0.40	+0.28	+0.46	+0.35
8.	43.89	-20.95	-2.55	+0.91	-0.31	+0.58	-1.09	+0.15	+0.27	+0.43	+0.55	+0.35
9.	42.80	-20.05	-2.89	+0.75	-0.29	+0.69	-1.20	+0.15	+0.30	+0.51	+0.62	+0.34
10.	42.02	-19.61	-2.97	+0.72	-0.33	+0.66	-1.30	+0.14	+0.37	+0.52	+0.60	+0.34
11.	41.38	-19.25	-3.07	+0.68	-0.37	+0.71	-1.42	+0.11	+0.34	+0.55	+0.67	+0.30
12.	40.87	-19.02	-2.93	+0.52	-0.21	+0.68	-1.40	+0.02	+0.17	+0.51	+0.76	+0.21
13.	40.27	-18.84	-3.03	+0.52	-0.17	+0.63	-1.35	-0.05	+0.20	+0.58	+0.81	+0.22
14.	39.79	-18.60	-3.13	+0.58	-0.14	+0.59	-1.29	+0.02	+0.18	+0.63	+0.80	+0.25
15.	39.37	-18.38	-3.20	+0.47	-0.13	+0.59	-1.35	+0.14	+0.11	+0.65	+0.79	+0.22
16.	39.01	-18.11	-3.28	+0.50	-0.19	+0.59	-1.41	+0.13	+0.15	+0.69	+0.75	+0.20
17.	38.83	-18.17	-3.30	+0.60	-0.48	+0.54	-1.37	+0.12	+0.24	+0.73	+0.70	+0.17
18.	39.71	-19.58	-3.05	+1.20	-1.01	+0.65	-1.18	+0.31	+0.38	+0.79	+0.61	+0.47
19.	41.25	-21.48	-2.62	+1.21	-0.92	+0.80	-1.46	+0.43	+0.34	+0.65	+0.66	+0.59
20.	43.11	-22.63	-2.60	+0.85	-0.49	+0.73	-1.51	+0.39	+0.35	+0.70	+0.58	+0.53
21.	45.12	-23.05	-2.59	+0.56	-0.13	+0.69	-1.31	+0.34	+0.50	+0.53	+0.42	+0.45
22.	46.82	-23.20	-2.63	+0.50	+0.07	+0.70	-1.20	+0.24	+0.54	+0.44	+0.37	+0.39
23.	48.14	-23.28	-2.63	+0.55	+0.22	+0.69	-1.17	+0.29	+0.54	+0.34	+0.40	+0.32
Mean of the 24 hours.	44.32	-21.41	-2.64	+0.80	-0.12	+0.63	-1.28	+0.22	+0.38	+0.45	+0.58	+0.32

From the temperatures computed by the formula with the constants in Table II., corrections have been obtained to the mean temperature of the day for each of the hours of observation throughout the year, to be employed whenever a less onerous system than that of hourly or two-hourly (equidistant) observation is adopted, as was the case in the second period (also of six years) at Toronto. Table III. exhibits these corrections for every hour on every fifth day throughout the year; the corrections on the intermediate days admitting of easy interpolation. The corrections are additive when in the larger character, and subtractive when in the smaller.

TABLE III.

Corrections for every Fifth Day of the Year, to be applied to the Temperature observed at Toronto at any of the hours of Mean Astronomical Time, in order to give the Mean Temperature of the Day.

First Part, January to June. The corrections in the smaller type are subtractive; in the larger type additive.

Days of the month.	Hours of Mean Astronomical Time.																								
	0h.	1h.	2h.	3h.	4h.	5h.	6h.	7h.	8h.	9h.	10h.	11h.	12h.	13h.	14h.	15h.	16h.	17h.	18h.	19h.	20h.	21h.	22h.	23h.	
January.	Subtractive.									Additive.														Subtractive.	
	5	2.3	2.8	3.1	3.0	2.4	1.5	0.7	0.4	0.0	0.1	0.5	0.7	1.4	1.9	2.1	2.2	2.3	2.4	1.7	1.8	1.6	0.7	0.5	1.6
	10	2.4	2.9	3.1	3.1	2.5	1.6	0.8	0.2	0.0	0.1	0.5	0.8	1.5	2.0	2.1	2.2	2.3	2.4	1.7	1.8	1.6	0.7	0.5	1.7
	15	2.5	3.0	3.3	3.2	2.7	1.7	0.9	0.4	0.1	0.1	0.5	0.8	1.5	2.0	2.1	2.2	2.3	2.5	1.8	1.9	1.6	0.7	0.6	1.7
	20	2.6	3.1	3.4	3.4	2.9	1.9	0.9	0.4	0.0	0.2	0.6	1.0	1.6	2.0	2.1	2.3	2.4	2.7	2.0	2.1	1.8	0.7	0.6	1.8
	25	2.8	3.4	3.7	3.8	3.3	2.1	1.2	0.4	0.0	0.2	0.7	1.1	1.6	2.0	2.1	2.4	2.6	2.8	2.3	2.5	2.1	0.8	0.6	1.9
	30	3.0	3.7	4.0	4.1	3.6	2.4	1.3	0.5	0.0	0.4	0.8	1.2	1.7	2.0	2.2	2.5	2.7	3.0	2.8	3.0	2.5	0.9	0.6	2.0
February.	4	3.3	4.1	4.4	4.5	3.9	2.7	1.5	0.6	0.0	0.5	0.9	1.4	1.6	2.0	2.3	2.6	3.0	3.2	3.3	3.5	2.8	1.0	0.7	2.2
	9	3.5	4.3	4.7	4.8	4.2	3.0	1.6	0.7	0.0	0.6	1.1	1.6	1.8	2.1	2.5	2.7	3.1	3.4	3.8	4.0	3.2	1.0	0.8	2.4
	14	3.8	4.7	5.1	5.0	4.5	3.3	1.8	0.9	0.0	0.6	1.2	1.7	1.8	2.2	2.5	3.0	3.3	3.7	4.2	4.3	3.3	1.0	1.0	2.6
	19	3.9	4.8	5.3	5.2	4.7	3.5	2.0	0.9	0.0	0.7	1.3	1.9	1.9	2.3	2.7	3.1	3.5	3.8	4.5	4.6	3.4	0.9	1.2	2.7
	24	4.1	5.0	5.5	5.4	4.8	3.8	2.1	1.1	0.1	0.8	1.4	2.0	2.0	2.4	2.8	3.3	3.6	4.0	4.7	4.6	3.2	0.6	1.4	2.9
March.	1	4.2	4.9	5.5	5.3	4.8	3.9	2.2	1.0	0.1	0.9	1.5	2.1	2.1	2.6	2.9	3.5	3.8	4.2	4.8	4.5	3.0	0.4	1.6	3.0
	6	4.2	5.0	5.5	5.3	4.8	3.9	2.3	1.0	0.0	0.9	1.6	2.2	2.3	2.7	3.1	3.5	3.8	4.3	4.8	4.4	2.7	0.2	1.7	3.1
	11	4.2	4.9	5.5	5.2	4.8	3.9	2.3	0.9	0.0	1.1	1.7	2.4	2.4	2.9	3.2	3.6	3.9	4.4	4.8	4.2	2.3	0.0	1.8	3.1
	16	4.2	4.8	5.4	5.2	4.7	4.0	2.3	0.8	0.1	1.1	1.8	2.4	2.5	2.9	3.3	3.6	4.0	4.5	4.8	3.9	1.9	0.2	1.9	3.2
	21	4.2	4.8	5.4	5.2	4.8	4.0	2.1	0.7	0.2	1.2	1.9	2.5	2.5	3.0	3.4	3.6	4.0	4.6	4.8	3.6	1.7	0.4	2.0	3.2
	26	4.2	4.9	5.4	5.3	4.9	4.1	2.3	0.7	0.3	1.3	2.0	2.6	2.6	3.0	3.6	3.8	4.1	4.7	4.9	3.6	1.4	0.5	2.0	3.3
	31	4.3	5.1	5.5	5.4	5.0	4.3	2.4	0.6	0.5	1.4	2.1	2.7	2.7	3.3	3.8	3.9	4.3	4.8	5.0	3.5	1.2	0.6	2.1	3.3
April.	5	4.5	5.3	5.7	5.7	5.3	4.5	2.7	0.6	0.6	1.6	2.3	2.8	2.8	3.5	4.0	4.1	4.5	5.0	5.2	3.4	1.2	0.7	2.2	3.5
	10	4.6	5.5	5.9	6.0	5.6	4.8	3.0	0.7	0.7	1.7	2.5	3.0	3.0	3.7	4.3	4.5	4.9	5.3	5.4	3.4	1.1	0.8	2.3	3.6
	15	4.9	5.8	6.2	6.3	5.9	5.2	3.4	0.8	0.7	1.8	2.6	3.1	3.3	4.0	4.7	4.9	5.3	5.7	5.5	3.3	1.0	1.0	2.5	3.9
	20	5.1	6.1	6.5	6.6	6.2	5.6	3.7	1.0	0.8	2.0	2.7	3.3	3.5	4.4	5.1	5.3	5.8	6.1	5.7	3.1	0.9	1.1	2.7	4.1
	25	5.4	6.4	6.8	6.8	6.5	5.9	4.0	1.3	0.8	2.1	2.9	3.5	3.9	4.8	5.5	5.9	6.4	6.0	5.7	3.0	0.8	1.3	3.0	4.3
	30	5.6	6.6	7.0	7.1	6.8	6.2	4.4	1.5	0.8	2.1	3.0	3.7	4.2	5.1	5.9	6.4	6.9	6.8	5.7	2.9	0.7	1.6	3.2	4.6
May.	5	5.7	6.7	7.1	7.2	7.0	6.5	4.6	1.7	0.7	2.2	3.1	3.9	4.6	5.5	6.3	6.9	7.3	6.4	5.7	2.7	0.5	1.8	3.5	4.7
	10	5.9	6.8	7.2	7.3	7.1	6.7	4.9	2.0	0.6	2.2	3.1	4.0	4.8	5.7	6.5	7.2	7.6	7.7	5.5	2.5	0.3	2.0	3.7	4.9
	15	5.9	6.8	7.2	7.2	7.2	6.8	5.0	2.2	0.5	2.3	3.3	4.2	5.0	5.9	6.7	7.4	7.9	7.8	5.4	2.4	0.2	2.1	3.8	4.9
	20	5.9	6.8	7.1	7.2	7.3	6.9	5.4	2.4	0.4	2.3	3.3	4.3	5.1	5.9	6.7	7.5	8.0	7.9	5.2	2.3	0.1	2.0	3.9	5.0
	25	5.9	6.7	7.0	7.2	7.3	6.9	5.5	2.5	0.4	2.3	3.4	4.4	5.2	6.0	6.8	7.5	8.0	7.9	5.1	2.3	0.1	2.2	3.9	5.0
	30	5.8	6.6	6.9	7.2	7.3	6.8	5.5	2.6	0.3	2.3	3.5	4.4	5.2	5.9	6.7	7.5	8.0	7.8	5.1	2.3	0.1	2.1	3.8	4.9
June.	5	5.8	6.6	6.9	7.2	7.4	6.9	5.6	2.7	0.3	2.3	3.6	4.5	5.2	5.9	6.6	7.5	8.0	7.8	5.1	2.4	0.1	2.0	3.7	4.8
	10	5.8	6.6	6.9	7.3	7.5	7.0	5.7	2.9	0.2	2.3	3.6	4.6	5.2	5.9	6.6	7.4	7.9	7.9	5.1	2.4	0.0	1.9	3.6	4.8
	15	5.9	6.6	7.0	7.4	7.6	7.0	5.7	3.0	0.3	2.5	3.8	4.8	5.3	6.0	6.7	7.5	8.0	7.9	5.2	2.4	0.1	1.8	3.5	4.8
	20	6.0	6.7	7.2	7.6	7.9	7.2	5.9	3.1	0.3	2.5	3.9	4.9	5.5	6.2	6.8	7.7	8.2	8.1	5.3	2.4	0.1	1.8	3.5	4.8
	25	6.1	6.9	7.5	7.8	8.0	7.3	6.2	3.3	0.4	2.7	4.0	5.1	5.7	6.4	7.0	7.8	8.4	8.3	5.5	2.3	0.0	1.8	3.5	4.9
	30	6.3	7.2	7.8	8.1	8.3	7.7	6.4	3.4	0.4	2.8	4.1	5.2	5.9	6.7	7.3	8.0	8.7	8.6	5.6	2.3	0.0	1.9	3.6	5.0

TABLE III. (Continued.)

Second Part, July to December. The corrections in the smaller type are subtractive; in the larger type additive.

Days of the month.	Hours of Mean Astronomical Time.																								
	0h.	1h.	2h.	3h.	4h.	5h.	6h.	7h.	8h.	9h.	10h.	11h.	12h.	13h.	14h.	15h.	16h.	17h.	18h.	19h.	20h.	21h.	22h.	23h.	
July.	Subtractive.								Additive.												Subtractive.				
	5	6 ⁵	7 ⁴	8 ¹	8 ⁴	8 ⁵	8 ⁰	6 ⁷	3 ⁵	0 ⁵	2 ⁹	4 ²	5 ³	6 ²	6 ⁹	7 ⁶	8 ³	8 ⁹	9 ⁰	5 ⁸	2 ³	0 ¹	2 ⁰	3 ⁷	5 ²
	10	6 ⁷	7 ⁶	8 ⁴	8 ⁶	8 ⁷	8 ²	6 ⁸	3 ⁵	0 ⁶	3 ⁰	4 ³	5 ⁵	6 ⁴	7 ²	7 ⁸	8 ⁵	9 ²	9 ²	6 ⁰	2 ⁴	0 ¹	2 ²	3 ⁹	5 ⁴
	15	6 ⁹	7 ⁸	8 ⁶	8 ⁸	8 ⁸	8 ⁴	6 ⁹	3 ⁵	0 ⁷	3 ¹	4 ³	5 ⁵	6 ⁵	7 ⁴	8 ⁰	8 ⁷	9 ³	9 ⁴	6 ²	2 ⁵	0 ¹	2 ³	4 ⁰	5 ⁶
	20	7 ⁰	7 ⁸	8 ⁷	8 ⁹	8 ⁹	8 ⁴	6 ⁸	3 ³	0 ⁹	3 ²	4 ³	5 ⁵	6 ⁶	7 ⁵	8 ⁰	8 ⁸	9 ³	9 ⁴	6 ⁴	2 ⁷	0 ¹	2 ⁴	4 ¹	5 ⁷
	25	7 ⁰	7 ⁹	8 ⁸	8 ⁹	8 ⁹	8 ⁴	6 ⁷	3 ¹	1 ⁰	3 ²	4 ³	5 ⁴	6 ⁶	7 ⁴	8 ⁰	8 ⁷	9 ²	9 ³	6 ⁴	2 ⁹	0 ⁰	2 ⁴	4 ³	5 ⁸
	30	7 ⁰	7 ⁹	8 ⁷	8 ⁹	8 ⁸	8 ³	6 ⁵	2 ⁸	1 ¹	3 ¹	4 ²	5 ³	6 ⁴	7 ²	7 ⁸	8 ⁵	9 ⁰	9 ⁰	6 ⁵	3 ¹	0 ¹	2 ⁴	4 ³	5 ⁸
August.	5	6 ⁹	7 ⁷	8 ⁵	8 ⁸	8 ⁶	8 ¹	6 ³	2 ⁴	1 ²	3 ¹	4 ²	5 ¹	6 ¹	6 ⁹	7 ⁵	8 ²	8 ⁶	8 ⁷	6 ⁶	3 ³	0 ²	2 ⁴	4 ³	5 ⁸
	10	6 ⁶	7 ⁴	8 ¹	8 ⁴	8 ³	7 ⁸	5 ⁹	2 ⁰	1 ³	3 ¹	4 ⁰	5 ⁰	5 ⁹	6 ⁶	7 ³	7 ⁹	8 ³	8 ⁴	6 ⁷	3 ⁶	0 ³	2 ²	4 ²	5 ⁶
	15	6 ⁵	7 ³	7 ⁹	8 ²	8 ¹	7 ⁵	5 ⁶	1 ⁷	1 ³	2 ⁸	3 ⁹	4 ⁷	5 ⁵	6 ¹	6 ⁸	7 ⁵	7 ⁸	8 ⁰	6 ⁶	3 ⁶	0 ³	2 ²	4 ¹	5 ⁶
	20	6 ³	7 ⁰	7 ⁶	7 ⁹	7 ⁸	7 ²	5 ²	1 ³	1 ³	2 ⁷	3 ⁷	4 ⁴	5 ¹	5 ⁷	6 ⁴	7 ¹	7 ⁵	7 ⁸	6 ⁵	3 ⁷	0 ⁴	2 ⁰	4 ⁰	5 ⁴
	25	6 ²	6 ⁸	7 ³	7 ⁶	7 ⁵	7 ⁰	4 ⁷	1 ⁰	1 ²	2 ⁵	3 ⁵	4 ²	4 ⁸	5 ⁴	6 ¹	6 ⁷	7 ¹	7 ⁵	6 ⁵	3 ⁶	0 ⁴	1 ⁹	3 ⁹	5 ³
	30	6 ¹	6 ⁷	7 ¹	7 ⁴	7 ²	6 ⁶	4 ³	0 ⁷	1 ²	2 ³	3 ⁴	4 ⁰	4 ⁵	5 ¹	5 ⁸	6 ⁴	6 ⁸	7 ³	6 ⁴	3 ⁶	0 ⁵	1 ⁸	3 ⁸	5 ²
September.	5	6 ⁰	6 ⁶	7 ⁰	7 ²	7 ⁰	6 ³	3 ⁹	0 ⁶	1 ⁰	2 ¹	3 ²	3 ⁹	4 ³	4 ⁸	5 ⁵	6 ¹	6 ⁶	6 ⁷	6 ³	3 ⁶	0 ⁶	1 ⁷	3 ⁶	5 ¹
	10	5 ⁹	6 ⁵	6 ⁹	7 ⁰	6 ⁹	6 ¹	3 ⁴	0 ⁴	1 ⁰	2 ⁰	3 ¹	3 ⁷	4 ¹	4 ⁷	5 ³	5 ⁸	6 ⁴	7 ⁰	6 ²	3 ⁶	0 ⁷	1 ⁶	3 ⁶	5 ⁰
	15	5 ⁹	6 ⁵	6 ⁹	7 ⁰	6 ⁷	5 ⁸	3 ¹	0 ⁴	0 ⁹	1 ⁹	3 ⁰	3 ⁶	4 ⁰	4 ⁶	5 ²	5 ⁶	6 ²	6 ⁸	6 ²	3 ⁶	0 ⁹	1 ⁶	3 ⁵	5 ⁰
	20	5 ⁹	6 ⁵	6 ⁹	6 ⁹	6 ⁵	5 ⁵	3 ⁰	0 ³	0 ⁸	1 ⁸	2 ⁹	3 ⁵	3 ⁹	4 ⁵	5 ⁰	5 ⁴	6 ⁰	6 ⁷	6 ¹	3 ⁷	1 ⁰	1 ⁴	3 ⁴	4 ⁹
	25	5 ⁹	6 ⁵	6 ⁹	6 ⁷	6 ⁴	5 ¹	2 ⁶	0 ⁴	0 ⁷	1 ⁷	2 ⁷	3 ⁴	3 ⁸	4 ⁴	4 ⁹	5 ³	5 ⁸	6 ⁴	6 ⁰	3 ⁸	1 ²	1 ⁴	3 ⁴	4 ⁹
	30	5 ⁸	6 ⁴	6 ⁸	6 ⁶	6 ²	4 ⁷	2 ³	0 ³	0 ⁶	1 ⁶	2 ⁶	3 ³	3 ⁷	4 ³	4 ⁸	5 ⁰	5 ⁵	6 ¹	5 ⁷	3 ⁹	1 ⁴	1 ³	3 ³	4 ⁸
October.	5	5 ⁷	6 ²	6 ⁶	6 ⁴	5 ⁹	4 ³	1 ⁹	0 ³	0 ⁶	1 ⁵	2 ⁴	3 ²	3 ⁶	4 ²	4 ⁶	4 ⁸	5 ³	5 ⁷	5 ⁴	4 ⁰	1 ⁵	1 ²	3 ²	4 ⁷
	10	5 ⁶	6 ⁰	6 ⁴	6 ²	5 ⁶	3 ⁹	1 ⁷	0 ³	0 ⁵	1 ⁴	2 ²	2 ⁹	3 ⁴	4 ⁰	4 ⁴	4 ⁶	4 ⁹	5 ²	5 ⁰	3 ⁹	1 ⁵	1 ²	3 ²	4 ⁶
	15	5 ³	5 ⁷	6 ¹	5 ⁸	5 ¹	3 ⁴	1 ³	0 ²	0 ⁵	1 ³	2 ⁰	2 ⁷	3 ²	3 ⁸	4 ²	4 ³	4 ⁶	4 ⁸	4 ⁶	3 ⁸	1 ⁶	1 ¹	3 ⁰	4 ⁴
	20	5 ⁰	5 ⁴	5 ⁷	5 ⁵	4 ⁷	2 ⁹	1 ¹	0 ²	0 ⁵	1 ¹	1 ⁸	2 ⁴	3 ¹	3 ⁶	3 ⁹	4 ⁰	4 ⁴	4 ⁴	4 ¹	3 ⁶	1 ⁵	1 ⁰	2 ⁹	4 ¹
	25	4 ⁷	5 ⁰	5 ³	5 ¹	4 ²	2 ⁵	1 ⁰	0 ¹	0 ⁴	1 ⁰	1 ⁶	2 ²	2 ⁹	3 ³	3 ⁶	3 ⁷	4 ⁰	4 ⁰	3 ⁶	3 ³	1 ⁴	0 ⁹	2 ⁶	3 ⁹
	30	4 ³	4 ⁶	4 ⁸	4 ⁶	3 ⁷	2 ¹	0 ⁸	0 ¹	0 ⁴	0 ⁹	1 ⁴	1 ⁹	2 ⁷	3 ⁰	3 ³	3 ⁵	3 ⁷	3 ⁶	3 ²	3 ¹	1 ⁴	0 ⁷	2 ⁴	3 ⁵
November.	5	3 ⁹	4 ³	4 ⁴	4 ²	3 ³	1 ⁹	0 ⁸	0 ¹	0 ³	0 ⁷	1 ²	1 ⁶	2 ⁴	2 ⁷	2 ⁹	3 ²	3 ⁴	3 ³	2 ⁹	2 ⁸	1 ³	0 ⁶	2 ¹	3 ²
	10	3 ⁶	3 ⁹	4 ¹	3 ⁹	3 ⁰	1 ⁶	0 ⁷	0 ¹	0 ³	0 ⁶	1 ⁰	1 ⁴	2 ¹	2 ⁴	2 ⁷	3 ⁰	3 ¹	3 ⁰	2 ⁶	2 ⁶	1 ⁴	0 ³	1 ⁸	2 ⁸
	15	3 ³	3 ⁷	3 ⁸	3 ⁶	2 ⁷	1 ⁵	0 ⁷	0 ¹	0 ²	0 ⁵	0 ⁸	1 ²	1 ⁸	2 ¹	2 ⁴	2 ⁷	2 ⁹	2 ⁸	2 ⁵	2 ⁵	1 ⁴	0 ¹	1 ⁵	2 ⁵
	20	3 ¹	3 ⁵	3 ⁶	3 ⁴	2 ⁶	1 ⁵	0 ⁵	0 ²	0 ¹	0 ⁴	0 ⁷	1 ⁰	1 ⁶	1 ⁹	2 ²	2 ⁵	2 ⁶	2 ⁴	2 ⁵	2 ⁵	1 ⁶	0 ²	1 ²	2 ³
	25	2 ⁹	3 ⁴	3 ⁵	3 ³	2 ⁵	1 ⁴	0 ⁵	0 ²	0 ¹	0 ³	0 ⁶	0 ⁸	1 ³	1 ⁶	2 ⁰	2 ³	2 ⁵	2 ⁴	2 ⁵	2 ⁵	1 ⁸	0 ⁵	1 ⁰	2 ⁰
	30	2 ⁸	3 ⁴	3 ⁵	3 ²	2 ⁵	1 ⁵	0 ⁶	0 ³	0 ⁰	0 ²	0 ⁵	0 ⁷	1 ¹	1 ⁵	1 ⁹	2 ²	2 ³	2 ²	2 ⁵	2 ⁶	2 ⁰	0 ⁷	0 ⁸	1 ⁹
December.	5	2 ⁷	3 ³	3 ⁴	3 ²	2 ⁵	1 ⁵	0 ⁷	0 ⁴	0 ⁰	0 ²	0 ⁵	0 ⁶	1 ⁰	1 ⁴	1 ⁸	2 ¹	2 ¹	2 ¹	2 ⁵	2 ⁷	2 ¹	0 ⁹	0 ⁶	1 ⁸
	10	2 ⁵	3 ²	3 ⁴	3 ¹	2 ⁴	1 ⁵	0 ⁷	0 ⁴	0 ⁰	0 ²	0 ⁵	0 ⁶	0 ⁹	1 ⁵	1 ⁹	2 ¹	2 ¹	1 ⁹	2 ⁵	2 ⁷	2 ²	1 ⁰	0 ⁵	1 ⁸
	15	2 ⁵	3 ²	3 ⁴	3 ¹	2 ⁵	1 ⁵	0 ⁸	0 ⁵	0 ¹	0 ²	0 ⁵	0 ⁶	0 ⁹	1 ⁵	1 ⁹	2 ⁰	2 ⁰	2 ⁰	2 ⁵	2 ⁶	2 ²	1 ⁰	0 ⁴	1 ⁷
	20	2 ⁴	3 ¹	3 ³	3 ⁰	2 ⁴	1 ⁵	0 ⁸	0 ⁵	0 ¹	0 ¹	0 ⁴	0 ⁶	1 ⁰	1 ⁶	1 ⁹	2 ¹	2 ⁰	2 ⁰	2 ³	2 ⁵	2 ¹	1 ⁰	0 ⁴	1 ⁶
	25	2 ⁴	3 ⁰	3 ²	3 ⁰	2 ⁴	1 ⁶	0 ⁸	0 ⁴	0 ¹	0 ¹	0 ⁴	0 ⁶	1 ¹	1 ⁷	1 ⁹	2 ⁰	2 ⁰	2 ¹	2 ²	2 ²	1 ⁹	0 ⁹	0 ⁴	1 ⁶
	30	2 ³	2 ⁹	3 ¹	3 ⁰	2 ²	1 ⁵	0 ⁸	0 ⁴	0 ¹	0 ¹	0 ⁵	0 ⁷	1 ²	1 ⁸	2 ⁰	2 ⁰	2 ¹	2 ¹	1 ⁹	2 ⁰	1 ⁸	0 ⁸	0 ⁵	1 ⁶

The temperatures at the several hours of the day and on the several days of the year, computed in the manner which has been described, furnish data for the delineation of the Chrono-Isothermal Lines in Plate X. figs. 1 and 2. The representation in this Plate of the phenomena of the temperature at Toronto is on the same principle which has long been used in maps of the magnetic isogonic, isoclinal, and isodynamic lines, in which three variables are comprehended, of which one, the magnetical element, is dependent upon the other two, viz. the geographical latitude and longitude. The principle is also the same as that adopted in ordinary isothermal maps; but, whereas in those maps the two variables upon which the meteorological variation is dependent are the geographical latitude and longitude, in the present case the two variables are the hour of the day and the day of the year. The variation of the temperature is here referred to *time* and not to *space*. This difference is intended to be conveyed by the term Chrono-Isothermals as applicable to lines of the present description, whilst those of the more customary form might not inappropriately be termed, for contradistinction, as suggested to me by Mr. WHEATSTONE, Topo-Isothermals. Representations of the Chrono-Isothermals in different localities might materially facilitate the comparison of the phenomena of the temperature in different parts of the globe; and if similar plates were constructed for each of the meteorological elements at the same locality, they might be useful for intercomparison, and for illustrating the mutual dependence of the elements on each other, to those who prefer a representation to the eye to the instruction conveyed by tabular abstracts. In fig. 1 the isothermals are represented which are comprised between the mean temperature of the year and the *highest* isothermal; in fig. 2 between the mean temperature and the *lowest* isothermal. In fig. 1, consequently, the isothermals increase in value from the circumference to the centre; whilst in fig. 2 they decrease from the circumference to the centre. To avoid too great a multiplicity of lines only every alternate degree (the even degrees of FAHRENHEIT'S scale) are drawn. Figs. 1 and 2 are so arranged on the Plate that the summer and winter solstices (marked by a dotted line) are in the same vertical. The abnormal character of the winter temperature of the North American Continent is strikingly manifested in this Plate.

From the temperatures computed from the six years of observation and represented in the plate, we learn many facts regarding the temperature at Toronto, which are interesting in themselves, and may become particularly so in their comparison with the phenomena in other parts of the globe. Amongst these may be noticed the following:—The mean annual range, or the difference between the mean temperatures of the coldest and hottest months (February and July), is $42^{\circ}7$. The warmest day of the year is July 28, being thirty-seven days after the summer solstice. The coldest day is February 14, being fifty-five days after the winter solstice. The mean temperature of the year is passed through on April 19 and October 15. The warmest and coldest days, and the days on which the mean temperature is passed through,

deduced by a similar process at Königsberg by BESSEL, at Paris, Turin and Padua by KÄMTZ, at Berlin by MÄDLER, and at Prague by FRITSCH and JELINEK, are collected by the last-named meteorologist in his memoir "On the daily march of the principal meteorological elements deduced from hourly observations at the Prague Observatory," published in the Transactions of the Imperial Academy of Sciences at Vienna in 1850, and are as follows :—

	Maximum.	Minimum.	Days on which the mean temp. of the year is passed through.	
			April	October
Königsberg	August 1	January 9	April 21	October 20
Berlin (18 years) . . .	July 18	January 19	April 19	October 21
Berlin (92 years) . . .	July 22	January 12	April 17	October 16
Prague (8 to 9 years) .	July 24	January 26	April 16	October 20
Prague (76 years) . . .	July 23	January 19	April 15	October 18
Paris	July 28	January 15	April 18	October 19
Turin	July 27	January 3	April 18	October 26
Padua	July 26	January 15	April 20	October 15

These may be compared with the corresponding epochs at Toronto, as derived respectively from the six-years and the twelve-years series discussed in this paper :

Toronto (1842, 5 to 1848, 5)	July 28	February 14	April 19	October 15
Toronto (1841 to 1852)	July 28	February 12	April 25	October 17

The anomalous character of the North American winter, so visible in the Chrono-Isothermal Plate, is also marked by the very late occurrence of the epoch of the *minimum* temperature, and the great dissimilarity in that respect from all the other stations. The systematic character of this anomaly is further shown by the fact, that every hour in the twenty-four has its minimum temperature between the 7th and 17th of February; the minimum occurs earliest, viz. on the 7th of February, at the hour of 2 P.M.; the minima of the hours of the night, or from 9 P.M. to 7 A.M. inclusive, fall the latest, viz. on the 15th, 16th and 17th of February; those of the intermediate hours on the intermediate days and in regular progression. The hours from 6 A.M. to 9 P.M. inclusive, or those of the *day*, have their *maximum* temperature between the 20th and 30th of July; those of the *night*, or from 11 P.M. to 5 A.M. inclusive, from the 3rd to the 12th of August. The portion of the twenty-four hours which is warmer than the mean temperature of the day varies considerably at different seasons; in part of November there are fourteen of the observation hours colder, and only ten warmer than the mean temperature of the day; in the greater part of July twelve of the observation hours are colder and twelve warmer; and in all the rest of the year thirteen hours colder and eleven warmer. This is seen in detail in Table III.; the dark lines which separate the additive from the subtractive corrections pass between the hours which are above and those which are below the mean temperature on every fifth day of the year. On the average of the whole year the mean tempe-

perature is passed through about 8^h 31^m A.M., and 7^h 44^m P.M., making intervals of 11^h 13^m and 12^h 47^m. The hours from 9 P.M. to 7 A.M. inclusive are throughout the year colder than the mean temperature of the day; those from 10 A.M. to 7 P.M. are throughout the year warmer than the mean temperature of the day; 8 and 9 A.M., and 8 P.M., are sometimes warmer and sometimes colder than the mean temperature; 8 A.M. is colder except for about three weeks in July, and 9 A.M. is warmer except from November 20 to March 11; 8 P.M. is colder from the middle of March till late in November, and either coincides with the mean temperature, or is slightly warmer during the remainder of the year.

The hours of highest and lowest temperature on every fifth day of the year, and the amount by which the temperature at those hours exceeds or falls short of the mean temperature of the day, may be examined in detail in Table III. From the third week of September until April, 2 P.M. is the warmest hour, with the exception of some days in January and February, when 3 P.M. is warmer; from April to the middle of May, and again from the end of July to the middle of September, 3 P.M. is the warmest hour; and from the middle of May to the middle of July, 4 P.M. The coldest hour from the latter part of April to the end of June, and again from the end of October to late in November, is 4 A.M.; from the middle of July to the middle of October, in January, and for a short time in the middle of April, it is 5 A.M.; from the latter end of February to early in April it is 6 A.M.; and generally in December and February 7 A.M. The range from the minimum to the maximum in the day is greatest in July (18°·2), and least at the end of December (5°·2). The daily range has but one maximum in the year, which is in July; not as at Prague, where June and July have a less range than the months immediately preceding and following them, and where consequently there are two maxima; a phenomenon attributed to the greater prevalence of clouds in June and July.

It may be desirable to add a few words on the assistance to observers of tables which furnish corrections to the mean temperature of the day for every hour of every day in the year, such as Table III. Besides their direct use at the station itself, they have a useful bearing, within a reasonable distance from the station, on the selection of observation hours in the many cases in which it may not be possible to observe at hourly or two-hourly intervals, by affording a ready means of estimating the amount of error to which a deduction from any limited combination of hours is subject. If we desire for example to seek the observation hours within the command of a single observer, which may give the best approximation to the mean temperature of the day, and to that of the month, and of the year, as well as to the *climatic* difference (*i. e.* the difference between the hottest and the coldest months), we find, that of homonymous hours, the best pairs at Toronto are 9^h—9^h and 10^h—10^h, 10^h—10^h being the better of the two; but that 8^h—8^h, which is a combination frequently adopted by observers, does not suit so well at Toronto as either 9^h—9^h or 10^h—10^h. The average errors in the different months, when the temperature is inferred from

observations at 9^h—9^h or 10^h—10^h instead of from hourly observations, are shown on the average of six years to be as follows:—the sign + denoting that the mean daily temperature in the month is given too high, and — that it is given too low, by the mean of the two compared with the mean of the twenty-four observations.

9 ^h —9 ^h				10 ^h —10 ^h			
January	—0.4	July	—0.4	January	0.0	July	—0.2
February	—0.8	August	—0.3	February	—0.1	August	+0.1
March	—0.5	September	—0.2	March	+0.1	September	+0.3
April	—0.4	October	—0.1	April	—0.1	October	+0.5
May	—0.1	November	—0.2	May	+0.3	November	+0.4
June	—0.3	December	—0.6	June	—0.2	December	0.0
Mean of the year —0°36				Mean of the year +0°09			

Difference of the hottest and coldest months:

Too great by 0°4

Too great by 0°15

For the purpose of combining with an approximate mean temperature of the day, an approximation also to the hottest and coldest hours of the day, and to the hours of maximum and minimum of other meteorological elements, *three* equidistant observations are frequently adopted in preference to a binary system, and the hours of 6 A.M., 2 P.M. and 10 P.M. appear to be usually preferred. These hours are still within the command of a single observer, though we often find substituted for them the non-equidistant hours of 7 A.M., 2 P.M. and 9 P.M., doubtless because they suit better the convenience of observers. On comparing the mean temperatures in the different months derived from 6^h, 2^h, 10^h, or 7^h, 2^h, 9^h, with the full complement of twenty-four hours, we find that the approximation to the mean temperature obtained by 7^h, 2^h, 9^h is not quite so good as by 6^h, 2^h, 10^h; and that either of the triplets give a less correct mean temperature than 10^h—10^h: 6½, 2, 9½ would appear a more suitable combination as far as regards approximation to the mean temperature.

6 A.M., 2 P.M., 10 P.M.				7 A.M., 2 P.M., 9 P.M.			
January	+0.3	July	—0.6	January	+0.4	July	+1.0
February	—0.1	August	—0.9	February	0.0	August	+0.5
March	—0.4	September	—0.7	March	+0.1	September	+0.5
April	—0.6	October	—0.2	April	+0.4	October	+0.3
May	—0.5	November	+0.2	May	+0.8	November	+0.3
June	—0.7	December	+0.1	June	+0.7	December	+0.2
Mean of the year —0°34				Mean of the year +0°43			

Difference of the hottest and the coldest months:

Too small by 0°4

Too great by 1°0

Three equidistant observations in the twenty-four hours are the utmost that can

be perseveringly maintained by a single observer. When there are two or more observers, there is no difficulty in multiplying the times of observation so as to comprehend all the objects that may be desired, each in the manner and by the means which are most suitable to it and will be most satisfactory. But as the work of observation at by far the greater number of meteorological stations is usually carried out by a single observer, and as this is likely to be always the case, it should be a primary object with meteorologists who are furnished with sufficient means, to form tables of corrections to the mean daily temperature for every hour of the day, upon the basis of a sufficient number of years of observation, to be used at the respective localities, or within the distances to which such tables may be severally applicable, by persons whose means or convenience may restrict them in respect to the number and choice of hours of observation. With such a table, similar to Table III. of this paper, the choice is disembarassed of its chief difficulty, that of selecting hours which by their combination will give an approximate mean temperature for the several months and for the year; and the observer is left free to give a preference, independent of such consideration, either to the hours when the phenomena change least rapidly, and when consequently small irregularities in the times of observation will be least injurious, or to the hours which will furnish the best approximation to the daily maxima and minima of the meteorological elements generally, viz. of the temperature, the tension of vapour, the pressure of the gaseous atmosphere, and the force of the wind; or to the hours which will have the most effective bearing upon other points of meteorological or climatic interest, to which the observer's attention may be directed.

The equation of the mean annual variation of the temperature, in the form most convenient for use, deduced from the twelve monthly means in the lowest horizontal line of Table I., is as follows:—

$$\begin{aligned} t_x = & +44^{\circ}32 - 21^{\circ}57 \sin(a + 82^{\circ}58') + 0^{\circ}81 \sin(2a + 278^{\circ}32') \\ & - 1^{\circ}43 \sin(3a + 333^{\circ}48') + 0^{\circ}44 \sin(4a + 30^{\circ}04') \\ & + 0^{\circ}73 \sin(5a + 37^{\circ}48') + 0.32 \cos 6a, \end{aligned}$$

in which $a = n \times 30^{\circ}$, n denoting the number of months and parts of a month between January 15th and x .

The equation of the mean diurnal variation of the temperature deduced from the twenty-four hourly means in the last vertical column of Table I. is—

$$\begin{aligned} t_x = & +44^{\circ}32 + 5^{\circ}513 \sin(a + 53^{\circ}40') + 0^{\circ}82 \sin(2a + 59^{\circ}08') \\ & - 0^{\circ}48 \sin(3a + 41^{\circ}41') - 0^{\circ}06 \sin(4a + 51^{\circ}23') \\ & + 0^{\circ}04 \sin(5a + 20^{\circ}35'), \end{aligned}$$

in which $a = n \times 15^{\circ}$, n being the number of hours and parts of an hour between x , and 0 hours or astronomical mean noon.

I now proceed to the second portion of the series, or to the six years in which the

observations were for the most part made on a less perfect system than that of twelve or twenty-four equidistant observations in the twenty-four hours. The hours of observation during this portion of the series were as follows:—

January 1841 to June 1842 inclusive; two-hourly equidistant.

July 1848 to December 1848 inclusive; 2, 3, 4, 9, 10, 11, 17, 19, 21, 22.

1849. January to December inclusive; 1, 2, 3, 5, 6, 9, 10, 11, 18, 19, 20, 22.

1850. January to April inclusive; hourly.

1850. May to June inclusive; 2, 3, 10, 11, 18, 19.

1850. July and August; hourly.

1850. September to December inclusive; two-hourly equidistant.

1851. January to April inclusive; two-hourly equidistant.

1851. May to December inclusive; 2, 4, 10, 12, 18, 20.

1852. January to December inclusive; 2, 4, 10, 12, 18, 20.

Whenever the observations during these six years were either hourly, or two-hourly and equidistant, a mean of the observations simply, without corrections applied to any of them, has been taken as the mean temperature of the day. In all the other cases corrections taken from Table III. have been applied individually to the observations at the hours to which they refer, and the mean temperature of the day has been computed from the mean of the observations so corrected.

Having thus obtained the mean daily temperatures during the second period of six years, we have the mean monthly temperatures derived from the twelve years as follows:—

January .	24°97	April .	41°14	July . .	66°41	October .	44°93
February .	23°40	May .	51°18	August .	66°16	November .	36°51
March . .	30°23	June .	61°05	September	58°02	December .	26°75

Mean of the whole 44°23.

Employing these values, we obtain the formula representing the mean annual variation of the temperature at Toronto as follows:—

$$\begin{aligned}
 t_x = & +44^{\circ}23 - 21^{\circ}81 \sin(a + 81^{\circ}27') + 1^{\circ}06 \sin(2a + 71^{\circ}32') \\
 & - 0^{\circ}80 \sin(3a + 347^{\circ}42') + 0^{\circ}22 \sin(4a + 37^{\circ}27') \\
 & + 0^{\circ}88 \sin(5a + 50^{\circ}41') + 0^{\circ}325 \cos 6a,
 \end{aligned}$$

$a = n \times 30^{\circ}$; n being reckoned as before from January 15th.

Table IV. (pages 154 to 159 inclusive) exhibits in column 1 the mean temperature of every day of the year, computed by the preceding formula; and in columns 2 to 13, under the respective years 1841 to 1852, the differences of the mean temperatures actually observed on each day from the mean of the twelve years computed as described and shown in column 1. These “differences” are the *non-periodic variations* of each day, on the assumption that the monthly means of twelve years furnish a sufficient basis for the deduction of approximate normal values; which is certainly

true within the limits which are at present required for the comparison of the non-periodic variations in Europe and America. The observed temperatures themselves may be obtained, if they are required, by adding or subtracting (as the case may be) from the mean daily temperature in column 1, the difference which stands on the same horizontal line with the *day*, and in the same vertical line with the *year*. The final column (14) shows for each day the *average* non-periodic variation in twelve years. We may learn, consequently, from this column, the average non-periodic variation in twelve years of any particular day of the year which may be surmised to be subject to some special physical peculiarity, causing it to be warmer or colder than the general progression of the temperature in the part of the year to which it belongs. An example of its application may be given by the reply which the values in this column furnish to the question*, whether the three days of May (the 11th, 12th, and 13th), which MÄDLER has stated to be characterized, on the average of eighty-six years of observation at Berlin, by a depression exceeding 2° FAHR. when compared with the general march of the temperature at that season, undergo a similar depression in North America. On a reference to the month of May in Table IV., it is seen in column 14 that on the average of the twelve years from 1841 to 1852, the 11th of May was $0^{\circ}1$ *below*, and on the 12th and 13th of May respectively $3^{\circ}1$ and $2^{\circ}4$ *above* the general mean of the temperature in those years. It may be seen also that the average non-periodic variation in the five days from the 8th to the 12th of May inclusive, is in the same twelve years $1^{\circ}1$ *above*, and in the five days from the 13th to the 17th inclusive $1^{\circ}0$ *above*, the general mean of the temperature. The meteorological observations at Toronto during these twelve years do not therefore support the supposition that the depression of temperature on the 11th, 12th and 13th of May, observed at Berlin, is a general and periodically recurring phenomenon over the whole globe; such as would be occasioned by a partial obscuration of the sun's disc by the intervention of a periodical stream of aërolites; but they tend rather to indicate that the depression observed in Europe may have been a partial phenomenon, having a local cause.

The not unfrequent occurrence of differences of large amount on single days, shown in columns 2 to 13, is an indication of the great variability of the climate of Toronto in regard to temperature; and the still remaining occasional magnitude of the daily averages in column 14, shows that the influence of non-periodic variations is by no means extinguished in the means of twelve years.

* Kosmos, Bd. i. S. 407. Anm. 56.

TABLE IV.—Non-Periodic Variations of the Temperature at Toronto, from January 1841 to December 1852 inclusive.

		Daily temperature derived from the monthly mean of the 12 years.	Difference on each day of the twelve years from the temperature derived from the monthly means.												Mean daily difference.
		1841.	1842.	1843.	1844.	1845.	1846.	1847.	1848.	1849.	1850.	1851.	1852.		
		(1.)	(2.)	(3.)	(4.)	(5.)	(6.)	(7.)	(8.)	(9.)	(10.)	(11.)	(12.)	(13.)	(14.)
January.	1	25.2	— 9.6	+ 8.2	Sunday.	— 0.1	+ 9.9	+ 8.5	+ 9.8	+ 19.0	— 11.2	— 3.7	— 2.0	+ 0.4	+ 2.7
	2	25.2	— 9.6	Sunday.	— 1.3	+ 8.1	+ 5.4	+ 9.0	+ 10.2	Sunday.	— 26.0	— 5.1	— 3.8	— 2.3	— 0.5
	3	25.1	Sunday.	— 9.6	— 14.7	+ 7.4	+ 12.4	+ 7.8	Sunday.	+ 11.5	— 17.0	— 2.7	— 9.5	— 2.1	— 1.7
	4	25.1	— 18.4	— 3.7	— 7.2	— 2.6	+ 10.2	Sunday.	+ 11.7	— 1.1	— 6.4	— 3.9	— 11.0	Sunday.	— 3.2
	5	25.1	— 4.8	— 11.5	+ 3.3	— 4.8	Sunday.	+ 4.8	+ 10.2	— 0.1	— 4.1	— 4.2	Sunday.	— 1.4	— 1.3
	6	25.1	+ 11.5	+ 7.6	+ 11.8	+ 1.6	— 7.1	+ 8.1	+ 6.4	— 13.4	— 6.5	Sunday.	+ 2.5	— 4.7	+ 1.6
	7	25.1	+ 10.6	+ 0.2	+ 13.4	Sunday.	— 1.4	+ 10.3	— 4.6	— 3.3	Sunday.	+ 4.5	— 3.1	— 15.8	+ 1.1
	8	25.1	— 3.4	+ 2.5	Sunday.	— 10.0	+ 4.4	+ 6.9	— 15.4	+ 4.6	— 1.7	+ 3.1	+ 1.4	— 3.3	— 1.0
	9	25.1	— 2.2	Sunday.	+ 2.9	— 1.7	+ 7.2	+ 3.9	— 9.4	Sunday.	— 15.4	+ 8.0	+ 11.8	+ 2.2	+ 0.7
	10	25.1	Sunday.	— 0.9	+ 7.8	— 4.4	+ 3.6	+ 4.7	Sunday.	— 21.3	— 27.8	+ 0.7	+ 9.1	— 3.8	— 3.2
	11	25.0	+ 5.3	+ 5.7	+ 5.6	— 5.9	+ 1.0	Sunday.	— 14.4	— 6.1	— 26.6	+ 12.0	+ 7.1	Sunday.	— 1.6
	12	25.0	+ 4.4	— 1.7	+ 7.4	+ 10.3	Sunday.	— 4.0	— 8.1	— 1.1	— 7.3	+ 5.1	Sunday.	— 10.0	— 0.5
	13	25.0	+ 0.1	— 6.6	+ 2.0	+ 5.5	— 8.2	— 3.8	+ 7.6	+ 11.3	+ 10.1	Sunday.	+ 5.7	— 14.7	+ 0.8
	14	25.0	+ 3.7	+ 9.7	— 1.3	Sunday.	— 7.5	+ 3.1	+ 11.8	+ 13.7	Sunday.	— 7.3	+ 12.3	— 1.0	+ 3.7
	15	25.0	+ 6.5	0.0	Sunday.	+ 7.6	+ 4.7	+ 10.3	+ 15.0	+ 15.3	+ 2.8	+ 6.0	+ 10.9	— 21.5	+ 5.2
	16	24.9	+ 11.2	Sunday.	— 1.6	+ 12.5	— 0.7	— 0.7	— 1.0	Sunday.	— 5.8	+ 9.7	+ 11.8	— 8.5	+ 2.7
	17	24.9	Sunday.	+ 9.1	+ 1.4	+ 2.9	— 5.3	— 16.4	Sunday.	+ 2.3	— 4.8	+ 10.2	— 7.2	— 18.4	— 2.6
	18	24.9	— 22.5	+ 10.1	+ 11.1	— 0.8	— 10.2	Sunday.	+ 3.7	— 8.0	— 14.2	+ 4.9	— 15.2	Sunday.	— 4.1
	19	24.8	— 15.4	+ 12.8	+ 14.6	— 9.4	Sunday.	— 14.7	— 16.2	— 4.9	— 10.7	+ 2.3	Sunday.	— 23.6	— 6.5
	20	24.8	— 0.1	+ 10.4	+ 13.3	— 14.7	+ 2.1	— 5.2	— 9.1	+ 12.1	— 0.4	Sunday.	+ 7.2	— 24.3	— 0.8
	21	24.7	+ 4.7	+ 1.3	+ 18.8	Sunday.	+ 6.3	— 7.3	— 16.8	+ 6.6	Sunday.	+ 11.1	+ 5.8	— 14.5	+ 1.6
	22	24.7	+ 0.8	— 12.3	Sunday.	— 1.9	+ 1.5	— 13.6	— 9.9	— 2.4	— 5.5	+ 5.2	+ 10.3	— 17.0	— 4.1
	23	24.6	+ 4.6	Sunday.	+ 9.1	+ 12.7	+ 8.2	— 9.0	+ 2.5	Sunday.	+ 0.4	+ 6.5	+ 8.3	— 7.1	+ 3.6
	24	24.5	Sunday.	— 3.2	+ 7.4	— 10.5	+ 10.7	+ 4.1	Sunday.	+ 3.0	+ 7.7	+ 11.6	+ 8.8	+ 1.4	+ 4.1
	25	24.5	+ 4.8	+ 9.1	— 10.1	— 25.8	— 0.4	Sunday.	+ 0.5	+ 11.6	+ 11.5	+ 12.4	+ 6.6	Sunday.	+ 2.0
	26	24.4	+ 5.8	+ 5.6	— 7.8	— 25.5	Sunday.	+ 8.1	+ 1.1	+ 14.1	+ 3.3	+ 9.0	Sunday.	— 6.4	+ 0.7
	27	24.3	+ 10.5	— 3.0	+ 3.1	— 24.7	+ 9.1	— 0.3	— 14.5	+ 13.0	— 2.4	Sunday.	— 3.7	— 1.3	— 0.4
	28	24.3	+ 4.0	+ 12.0	— 0.3	Sunday.	+ 11.4	+ 9.8	— 7.5	+ 7.1	Sunday.	+ 2.8	+ 8.9	+ 8.7	+ 5.7
	29	24.2	+ 8.4	+ 16.2	Sunday.	— 20.9	+ 0.5	+ 11.7	+ 2.3	+ 5.6	+ 9.6	+ 0.6	— 22.5	+ 10.4	+ 2.0
	30	24.1	+ 4.5	Sunday.	+ 6.0	— 15.4	— 8.3	+ 12.3	— 9.0	Sunday.	— 10.2	+ 2.4	— 25.6	+ 1.0	— 4.2
	31	24.0	Sunday.	+ 8.2	+ 6.4	— 18.9	— 18.1	— 9.1	Sunday.	+ 8.2	— 14.7	+ 9.2	— 10.3	— 0.2	— 3.9
February.	1	23.9	— 10.0	+ 7.1	— 13.5	— 5.3	— 20.6	Sunday.	+ 6.3	+ 0.9	+ 4.4	+ 3.5	— 1.9	Sunday.	— 2.9
	2	23.9	— 0.7	+ 14.5	— 9.3	— 2.3	Sunday.	+ 4.7	+ 14.2	+ 8.9	+ 6.2	+ 5.6	Sunday.	+ 0.2	+ 4.2
	3	23.8	— 6.6	+ 18.3	— 0.8	— 5.3	— 3.2	+ 11.7	+ 2.3	+ 8.9	— 4.5	Sunday.	+ 5.5	+ 5.6	+ 2.9
	4	23.7	— 0.8	+ 10.7	+ 1.1	Sunday.	— 7.3	+ 11.3	— 7.9	+ 10.9	Sunday.	— 16.3	+ 8.1	+ 13.6	+ 2.3
	5	23.6	+ 4.3	+ 7.6	Sunday.	+ 9.7	— 11.3	+ 10.3	— 7.3	+ 2.3	— 8.7	— 14.1	+ 1.6	+ 9.3	+ 0.3
	6	23.6	+ 5.8	Sunday.	— 14.9	+ 5.8	— 12.4	+ 8.8	— 3.7	Sunday.	+ 2.2	— 2.1	— 12.9	+ 8.1	— 1.5
	7	23.5	Sunday.	+ 6.3	— 12.1	— 1.4	— 6.1	+ 7.9	Sunday.	— 1.9	— 12.8	+ 8.3	— 10.9	+ 5.6	— 1.7
	8	23.5	+ 2.8	— 14.9	— 12.7	— 1.2	— 11.7	Sunday.	+ 9.1	+ 0.1	+ 1.2	+ 12.9	— 18.7	Sunday.	— 3.3
	9	23.4	+ 4.3	— 0.5	— 9.7	— 12.6	Sunday.	— 13.3	+ 5.5	+ 6.8	— 7.9	+ 11.9	Sunday.	+ 10.0	— 0.5
	10	23.4	— 10.4	+ 7.4	+ 4.8	— 2.3	+ 6.2	— 13.6	+ 1.2	— 11.4	— 1.4	Sunday.	+ 3.2	+ 11.5	— 0.4
	11	23.4	— 18.9	+ 12.4	— 4.2	Sunday.	+ 7.4	— 8.6	— 6.0	— 13.0	Sunday.	+ 5.7	— 8.7	+ 10.8	— 2.3
	12	23.4	— 17.1	+ 5.7	Sunday.	+ 5.0	— 7.6	— 7.6	— 6.0	— 5.5	— 17.5	+ 3.7	+ 1.2	— 3.8	— 4.5
	13	23.4	— 9.2	Sunday.	— 9.0	+ 9.4	— 16.7	+ 3.7	— 2.5	Sunday.	— 10.2	+ 4.2	+ 9.6	— 5.1	— 2.6
	14	23.4	Sunday.	— 8.0	— 15.5	— 1.6	+ 3.4	+ 4.5	Sunday.	+ 6.5	— 19.1	+ 4.2	+ 14.4	— 8.6	— 2.0
	15	23.4	— 5.4	+ 0.1	— 13.7	+ 6.6	+ 12.8	Sunday.	— 1.8	+ 1.7	— 21.5	— 9.3	+ 15.0	Sunday.	— 1.5
	16	23.5	+ 4.7	— 4.0	— 20.0	+ 6.2	Sunday.	— 0.8	— 4.8	+ 5.0	— 20.6	+ 1.6	Sunday.	— 6.4	— 3.9
	17	23.5	+ 0.5	— 11.3	— 20.0	— 7.8	+ 11.4	— 1.3	+ 0.5	+ 4.7	— 16.5	Sunday.	+ 6.3	— 11.4	— 4.1
	18	23.6	+ 4.0	+ 7.1	— 18.4	Sunday.	+ 9.0	— 8.1	+ 5.5	+ 7.8	Sunday.	+ 8.8	+ 4.0	— 21.0	— 0.1
	19	23.7	— 1.1	— 5.6	Sunday.	+ 9.7	+ 11.4	+ 0.4	+ 6.1	+ 12.1	— 19.8	— 8.0	+ 10.4	— 17.4	— 0.2
	20	23.8	+ 7.2	Sunday.	— 9.4	+ 14.4	+ 14.9	+ 2.5	— 2.3	Sunday.	— 6.2	+ 9.8	+ 14.5	— 13.7	+ 3.2
	21	23.9	Sunday.	+ 0.1	— 3.2	+ 11.5	+ 15.4	+ 1.9	Sunday.	+ 14.8	+ 3.7	+ 3.9	+ 11.3	+ 1.6	+ 6.1
	22	24.0	+ 13.6	— 0.9	— 11.8	+ 11.8	+ 13.7	Sunday.	— 9.9	+ 10.5	+ 6.5	— 12.0	+ 12.6	Sunday.	+ 3.4
	23	24.1	— 11.4	+ 4.6	— 14.8	+ 1.5	Sunday.	— 5.6	— 17.5	+ 5.8	+ 8.2	— 3.5	Sunday.	+ 7.2	— 2.5
	24	24.3	— 3.4	+ 5.8	— 3.3	— 9.4	+ 13.7	— 12.8	— 6.7	— 1.2	+ 9.3	Sunday.	+ 11.1	+ 9.7	+ 1.2
	25	24.5	+ 5.9	+ 1.7	+ 3.6	Sunday.	+ 18.0	— 17.4	— 7.5	— 7.4	Sunday.	+ 10.8	+ 6.0	+ 3.4	+ 1.7
	26	24.7	+ 7.4	+ 9.1	Sunday.	+ 9.4	+ 9.1	— 25.4	+ 0.2	+ 2.5	+ 10.0	+ 13.9	+ 11.0	— 7.2	+ 3.6
	27	24.9	+ 9.6	Sunday.	— 2.5	+ 4.9	+ 5.9	— 16.4	+ 4.2	Sunday.	+ 9.8	+ 7.4	+ 9.2	— 5.8	+ 2.6
	28	25.1	Sunday.	+ 10.0	— 4.7	+ 6.6	+ 5.1	— 9.8	Sunday.	+ 5.4	+ 11.7	+ 9.4	— 3.0	+ 2.5	+ 3.3

TABLE IV. (Continued.)

		Daily temperature derived from the monthly mean of the 12 years.	Difference on each day of the twelve years from the temperature derived from the monthly means.												Mean daily difference.
		1841.	1842.	1843.	1844.	1845.	1846.	1847.	1848.	1849.	1850.	1851.	1852.		
		(1.)	(2.)	(3.)	(4.)	(5.)	(6.)	(7.)	(8.)	(9.)	(10.)	(11.)	(12.)	(13.)	(14.)
March.	1	25.4	+ 2.7	+11.3	-10.7	+15.3	+11.3	Sunday.	- 0.7	-13.2	+ 0.8	+ 5.9	+ 2.1	- 8.1	+1.5
	2	25.6	- 7.4	+15.1	-14.4	+ 9.2	Sunday.	- 8.4	- 1.7	- 9.0	- 2.5	+ 4.1	Sunday.	-12.7	-2.8
	3	25.9	- 2.4	+17.5	-10.8	Sunday.	+ 4.0	- 3.8	+ 1.1	- 5.2	- 5.2	Sunday.	- 4.0	-13.0	-2.2
	4	26.2	- 8.9	+12.7	-11.2	- 8.7	+ 9.6	+ 8.1	- 2.3	- 7.3	Sunday.	- 3.0	+ 4.9	- 5.3	-1.0
	5	26.4	- 6.6	+ 3.9	Sunday.	+ 3.7	+ 9.2	+ 8.5	- 1.0	Sunday.	+ 5.3	+ 6.3	+ 3.1	+ 1.0	+3.3
	6	26.7	- 2.5	Sunday.	-14.1	+ 5.9	+ 7.1	- 5.2	+ 5.6	- 3.0	+ 7.7	+ 7.7	- 0.6	- 7.3	+0.1
	7	27.0	Sunday.	+ 3.3	-13.1	+ 8.2	+11.8	- 1.4	Sunday.	+ 9.3	+10.0	+ 6.1	- 2.6	Sunday.	+3.5
	8	27.4	- 0.5	+ 7.3	- 2.8	+10.8	+18.5	Sunday.	- 1.5	+ 9.6	+ 2.8	- 1.3	- 3.5	+ 5.0	+4.0
	9	27.7	- 0.3	+13.0	- 3.6	+ 3.1	Sunday.	+ 5.2	- 5.5	- 2.8	+ 3.3	+ 2.7	Sunday.	+10.0	+2.5
	10	28.0	- 8.9	+ 8.3	+ 4.4	Sunday.	+ 4.5	+ 4.9	+ 0.4	- 5.8	+ 2.8	Sunday.	+ 3.8	+ 1.0	+1.5
	11	28.4	- 9.7	- 3.6	- 2.0	+10.4	+ 4.6	+ 6.5	-13.1	- 0.4	Sunday.	- 3.2	+ 6.7	+ 4.8	+0.1
	12	28.7	- 1.7	- 4.1	Sunday.	+11.4	+ 7.3	+11.1	-12.8	Sunday.	+ 2.4	+ 0.1	- 4.8	+10.2	+1.9
	13	29.1	- 1.5	Sunday.	- 3.3	+ 9.2	+ 7.7	+10.1	-10.4	- 9.2	+ 7.3	+ 7.7	+ 3.0	+11.0	+2.9
	14	29.5	Sunday.	+ 2.3	- 5.4	+ 1.2	+ 1.3	+ 5.2	Sunday.	-20.2	+ 3.5	+ 9.3	- 0.6	Sunday.	-0.4
	15	29.9	-15.3	+ 4.1	- 9.6	+ 3.6	-11.7	Sunday.	-12.8	-18.8	+ 8.3	+ 3.7	+10.0	+ 4.1	-3.1
	16	30.2	-13.5	+ 9.3	- 9.3	+ 3.4	Sunday.	- 2.0	-13.0	- 5.8	+ 7.4	+ 1.8	Sunday.	+ 2.4	-1.9
	17	30.6	-15.0	+14.7	- 5.8	Sunday.	- 1.5	- 3.1	- 1.4	- 7.8	+ 0.1	Sunday.	+ 3.1	+ 7.5	-0.9
	18	31.0	- 3.2	+ 5.7	- 8.3	-15.3	- 7.5	+ 3.3	+ 2.5	- 1.7	Sunday.	+ 0.4	+ 2.3	- 6.6	-2.6
	19	31.4	+ 7.6	+16.9	Sunday.	- 4.6	- 9.5	+ 6.2	+ 0.6	Sunday.	+ 1.2	- 7.6	- 2.8	-10.4	-0.2
	20	31.8	+13.4	Sunday.	- 9.3	- 5.6	- 3.2	+ 7.4	+ 3.6	+ 3.9	+ 7.6	-13.1	+ 1.9	-15.1	-0.8
	21	32.2	Sunday.	- 1.6	- 9.3	- 8.2	Good Friday	+ 0.6	Sunday.	+ 7.3	+ 4.9	- 6.3	+ 1.9	Sunday.	-1.3
	22	32.6	+ 3.8	+ 0.1	-11.5	- 5.4	+ 2.5	Sunday.	- 0.8	+ 1.9	0.0	+ 0.5	+ 3.6	- 8.0	-1.2
	23	32.9	+ 4.9	+ 0.2	-20.3	- 6.0	Sunday.	+ 6.6	+ 3.1	+ 1.4	+ 9.1	- 1.6	Sunday.	- 6.0	-0.9
	24	33.3	+ 7.3	+ 2.0	-15.0	Sunday.	- 0.1	+ 6.5	+ 0.3	+ 3.1	+ 1.7	Sunday.	+ 6.4	- 5.3	+0.7
	25	33.7	+ 4.9	Good Friday	-12.7	+ 6.0	+ 4.3	+ 5.1	+ 4.2	+ 6.1	Sunday.	-10.1	- 2.8	- 7.7	-0.3
	26	34.1	+ 8.2	+ 6.0	Sunday.	+ 4.0	+10.6	+ 4.7	- 3.0	Sunday.	- 4.6	- 8.2	+ 8.3	- 1.3	+2.5
	27	34.5	+ 3.7	Sunday.	- 7.0	- 1.5	+10.3	+ 4.0	-12.8	- 0.2	- 4.6	- 4.9	+16.4	- 3.1	0.0
	28	34.8	Sunday.	- 0.8	- 4.0	+ 3.6	+ 8.7	+ 1.0	Sunday.	+ 4.6	+ 5.5	- 2.1	- 0.8	Sunday.	+1.7
	29	35.2	- 5.1	+ 2.8	- 7.4	- 7.7	+14.6	Sunday.	- 1.8	+ 8.2	+ 5.5	Good Friday	+ 4.0	- 1.9	+1.1
	30	35.6	-13.8	+10.2	-10.1	-14.8	Sunday.	- 0.9	-12.3	+ 4.2	+ 8.4	- 1.7	Sunday.	- 7.3	-3.8
	31	36.0	- 3.6	- 8.8	-10.4	Sunday.	+18.5	- 0.7	-17.4	+10.9	+ 3.5	Sunday.	+ 1.7	- 2.0	-0.8
April.	1	36.3	+ 2.7	- 0.6	- 9.3	- 3.6	+ 0.2	- 1.7	- 9.5	- 3.0	Sunday.	+ 1.3	+ 3.5	- 4.3	-2.2
	2	36.7	- 1.7	+17.5	Sunday.	+ 2.9	+ 1.9	- 1.6	Good Friday	Sunday.	+ 1.4	+ 4.5	+ 6.6	- 8.1	+2.6
	3	37.1	+ 1.3	Sunday.	- 7.2	+14.6	- 3.5	+ 1.1	- 1.5	+ 7.4	+ 8.6	+ 8.0	+ 1.6	- 9.5	+1.9
	4	37.4	Sunday.	0.0	- 4.6	+11.8	- 1.5	+ 5.4	Sunday.	+ 3.4	+ 6.9	+ 3.1	- 4.2	Sunday.	+2.3
	5	37.8	- 2.1	+ 2.6	- 3.0	Good Friday	-10.7	Sunday.	+ 0.5	- 2.0	- 0.9	- 1.6	- 1.9	- 6.2	-2.5
	6	38.1	- 2.1	+ 3.5	- 4.0	- 0.4	Sunday.	+ 8.6	+ 5.4	+ 3.0	Good Friday	- 1.4	Sunday.	- 5.8	+0.8
	7	38.5	- 3.0	+ 2.6	- 2.4	Sunday.	-13.6	+ 9.5	+ 6.0	+ 0.9	+11.5	Sunday.	+ 1.0	- 6.4	+0.6
	8	38.8	- 1.1	- 3.2	+ 3.0	+12.5	-13.6	- 3.6	+ 6.5	+ 6.0	Sunday.	-13.1	+ 3.2	- 4.3	-0.7
	9	39.1	Good Friday	- 0.2	Sunday.	+ 9.2	- 3.8	- 0.4	+ 0.9	Sunday.	+ 2.7	-10.4	+ 0.7	- 3.4	-0.5
	10	39.5	-12.7	Sunday.	- 3.0	+11.4	+ 1.4	Good Friday	+ 2.0	+15.3	+ 6.0	- 7.4	- 3.2	- 3.4	+0.6
	11	39.8	Sunday.	+ 9.8	- 0.3	+10.6	- 4.9	+ 2.4	Sunday.	+ 6.5	- 3.8	-10.3	- 8.2	Sunday.	+0.2
	12	40.2	- 5.1	0.0	+ 0.9	+14.2	+ 0.3	Sunday.	+ 0.1	+ 7.2	- 3.9	- 4.1	- 8.0	- 0.3	+0.1
	13	40.5	- 2.9	- 3.2	- 1.2	+17.0	Sunday.	- 8.9	- 0.7	- 2.1	- 2.6	- 9.3	Sunday.	- 2.8	-1.7
	14	40.8	- 8.5	- 1.3	Good Friday	Sunday.	+ 6.5	- 2.9	- 1.7	+ 0.2	-16.7	Sunday.	- 1.6	+ 0.3	-2.9
	15	41.1	- 7.0	- 3.2	+ 5.1	+11.1	+ 9.4	- 9.5	- 8.6	+ 8.0	Sunday.	- 9.5	- 1.9	+ 2.5	-0.4
	16	41.5	- 0.2	- 2.8	Sunday.	+ 9.4	+ 1.3	- 3.1	- 6.5	Sunday.	- 9.9	-14.3	+ 3.4	+ 2.0	-2.1
	17	41.8	+ 6.8	Sunday.	+ 0.2	- 1.8	+ 0.1	+ 6.7	-11.8	- 2.2	- 3.3	-14.9	+ 0.8	+ 2.7	-1.5
	18	42.1	Sunday.	- 2.4	- 6.5	- 3.2	+ 2.0	+ 8.9	Sunday.	-11.8	- 5.8	- 9.6	Good Friday	Sunday.	-3.6
	19	42.4	- 3.8	+ 1.6	- 2.9	+ 1.5	0.0	Sunday.	- 5.1	- 9.5	- 4.1	- 2.6	- 3.4	+ 4.6	-2.2
	20	42.8	-11.4	+ 5.2	- 1.2	+ 5.6	Sunday.	+ 8.3	- 0.1	- 1.6	- 8.3	- 5.1	Sunday.	+ 1.3	-0.7
	21	43.1	- 4.7	+11.9	+ 4.9	Sunday.	- 1.3	+14.3	+12.4	Good Friday	- 7.5	Sunday.	- 2.0	+ 4.5	+3.6
	22	43.4	- 2.4	+18.3	+ 4.8	+ 6.5	+ 4.2	+ 3.1	- 0.6	+ 0.2	Sunday.	+ 6.3	+ 3.7	- 2.7	+3.8
	23	43.7	+ 2.4	- 1.7	Sunday.	+11.4	+11.6	+ 9.4	- 7.1	Sunday.	- 2.9	- 8.9	+ 4.8	-10.0	+0.9
	24	44.0	+ 7.3	Sunday.	+ 5.8	+11.3	+12.0	+ 7.3	- 5.2	- 6.9	- 6.3	- 1.6	+ 5.7	- 5.5	+2.2
	25	44.4	Sunday.	+ 3.1	+ 2.3	+ 5.7	- 1.2	- 2.4	Sunday.	- 4.5	- 0.7	+ 2.9	+ 5.5	Sunday.	+1.2
	26	44.7	+ 4.4	+ 1.1	+ 6.2	- 2.4	+ 3.9	Sunday.	+ 6.1	- 6.2	- 8.6	+ 4.4	+ 0.5	- 5.9	+0.3
	27	45.0	- 4.2	- 4.2	+ 2.8	- 5.2	Sunday.	+ 4.0	- 8.2	- 1.7	- 7.1	+ 8.1	Sunday.	- 6.4	-2.2
	28	45.4	- 0.5	- 4.2	+ 9.7	Sunday.	+ 7.5	+ 7.1	- 8.7	- 1.6	+ 2.5	Sunday.	- 1.5	- 6.3	+0.4
	29	45.7	- 2.5	- 1.7	- 8.0	+ 2.3	+ 7.3	+ 2.0	- 7.5	- 2.8	Sunday.	- 2.5	- 0.4	- 2.3	-1.5
	30	46.0	+ 0.6	+ 2.6	Sunday.	+ 6.3	+ 7.3	+ 6.0	- 7.7	Sunday.	+ 2.1	+ 2.7	- 2.1	- 1.5	+1.6

TABLE IV. (Continued.)

		Daily temperature derived from the monthly mean of the 12 years.	Difference on each day of the twelve years from the temperature derived from the monthly means.												Mean daily difference.
		1841.	1842.	1843.	1844.	1845.	1846.	1847.	1848.	1849.	1850.	1851.	1852.		
		(1.)	(2.)	(3.)	(4.)	(5.)	(6.)	(7.)	(8.)	(9.)	(10.)	(11.)	(12.)	(13.)	(14.)
May.	1	46.4	- 3.2	Sunday.	- 7.9	+ 11.6	+ 9.3	+ 7.5	Not obs.	- 3.7	- 3.9	- 7.9	- 6.6	- 0.9	- 0.6
	2	46.7	Sunday.	- 1.1	- 6.0	+ 12.7	+ 1.3	+ 7.3	Sunday.	+ 0.6	- 7.9	- 4.2	- 9.4	Sunday.	- 0.7
	3	47.0	- 14.6	+ 0.6	- 2.1	+ 8.5	+ 6.9	Sunday.	Not obs.	+ 5.4	- 7.2	- 0.2	- 8.7	- 0.6	- 1.2
	4	47.4	- 8.7	- 2.5	- 6.7	+ 2.3	Sunday.	+ 7.4	- 1.0	+ 6.0	- 0.6	- 1.9	Sunday.	- 4.6	- 1.0
	5	47.7	- 7.1	+ 1.5	- 7.3	Sunday.	- 6.9	+ 7.8	- 0.3	+ 12.8	- 10.2	Sunday.	- 5.8	+ 4.2	- 1.1
	6	48.0	- 5.8	+ 4.2	- 1.5	+ 2.6	- 3.2	+ 2.3	+ 1.3	+ 14.7	Sunday.	- 5.6	- 5.4	+ 6.1	+ 0.9
	7	48.4	- 6.4	- 4.8	Sunday.	+ 7.3	- 8.3	+ 4.4	+ 7.7	Sunday.	- 5.9	- 2.1	- 1.1	+ 8.0	- 0.1
	8	48.7	- 2.7	Sunday.	- 2.4	+ 6.3	- 5.9	+ 8.6	+ 6.4	+ 2.0	- 3.6	+ 0.3	+ 3.7	+ 10.1	+ 2.1
	9	49.1	Sunday.	- 6.8	+ 0.7	+ 1.0	- 1.2	+ 5.2	Sunday.	+ 3.1	- 2.9	- 7.6	+ 10.5	Sunday.	+ 0.2
	10	49.4	- 1.6	+ 6.1	+ 1.3	- 2.5	+ 1.9	Sunday.	+ 6.8	+ 1.1	- 4.3	- 8.6	+ 2.2	- 2.4	0.0
	11	49.8	+ 4.8	- 3.7	+ 3.4	+ 9.0	Sunday.	- 8.1	+ 7.5	- 2.0	- 5.1	- 7.4	Sunday.	+ 0.5	- 0.1
	12	50.1	- 2.0	- 2.7	+ 6.3	Sunday.	+ 14.7	- 0.2	+ 10.0	- 5.3	- 3.4	Sunday.	+ 9.9	+ 4.1	+ 3.1
	13	50.5	- 5.1	- 6.9	+ 8.9	- 7.1	+ 12.1	+ 8.9	+ 6.7	- 10.8	Sunday.	+ 7.0	+ 10.3	+ 2.8	+ 2.4
	14	50.8	- 6.8	- 6.7	Sunday.	- 0.8	+ 7.9	+ 11.2	+ 2.8	Sunday.	- 4.0	- 0.3	+ 0.6	+ 2.5	+ 0.6
	15	51.2	- 4.1	Sunday.	+ 11.5	+ 3.6	- 10.7	+ 1.1	+ 7.5	- 2.0	- 3.6	+ 5.3	- 0.8	- 1.3	+ 0.6
	16	51.5	Sunday.	+ 1.8	+ 1.3	+ 3.0	- 10.3	+ 2.9	Sunday.	- 0.3	+ 1.0	+ 4.7	+ 5.7	Sunday.	+ 1.1
	17	51.9	+ 3.1	+ 0.3	- 6.4	+ 1.7	- 0.3	Sunday.	+ 5.8	+ 2.4	+ 1.4	- 7.3	+ 5.2	- 5.0	+ 0.1
	18	52.2	+ 1.1	+ 8.2	- 3.6	- 1.6	Sunday.	- 5.1	+ 6.3	+ 8.6	+ 1.9	- 7.5	Sunday.	- 6.9	+ 0.1
	19	52.5	- 4.3	- 6.6	- 3.3	Sunday.	+ 3.9	- 6.5	+ 6.8	+ 9.9	+ 2.0	Sunday.	- 0.6	- 6.9	- 0.6
	20	52.9	+ 1.4	- 9.3	- 0.2	- 5.3	- 5.9	+ 1.2	+ 1.2	+ 9.7	Sunday.	- 15.8	+ 7.3	- 11.8	- 2.5
	21	53.2	+ 5.2	- 2.3	Sunday.	- 12.5	- 2.7	- 10.2	+ 1.7	Sunday.	+ 5.7	- 9.6	+ 1.5	- 0.4	- 2.4
	22	53.6	+ 3.6	Sunday.	- 1.5	- 6.3	- 10.3	- 1.8	+ 6.1	+ 3.5	- 1.0	- 8.0	+ 0.3	+ 2.9	- 1.1
	23	53.9	Sunday.	- 1.6	- 3.5	+ 1.6	- 3.1	+ 5.2	Sunday.	+ 2.7	- 0.6	- 2.9	- 8.7	Sunday.	- 1.2
	24	54.2	+ 8.3	- 3.2	- 0.1	+ 5.5	- 10.8	Sunday.	+ 2.7	+ 6.7	- 11.7	+ 3.4	- 7.1	+ 7.5	+ 0.1
	25	54.6	+ 6.0	- 2.6	- 1.3	+ 11.4	Sunday.	+ 11.3	+ 0.1	+ 7.0	- 9.2	- 0.7	Sunday.	- 1.5	+ 2.1
	26	54.9	+ 4.3	- 1.7	- 2.0	Sunday.	+ 7.3	+ 11.8	- 8.3	+ 1.6	- 4.8	Sunday.	+ 2.7	- 4.3	+ 0.7
	27	55.2	+ 3.6	- 5.8	- 3.9	+ 7.2	+ 5.4	+ 12.5	- 3.0	+ 2.5	Sunday.	- 17.0	+ 0.4	- 3.7	- 0.2
	28	55.6	+ 8.6	- 3.9	Sunday.	+ 4.2	- 2.7	+ 7.3	+ 7.2	Sunday.	- 1.2	+ 8.0	+ 2.2	- 0.5	+ 2.9
	29	55.9	+ 0.6	Sunday.	- 2.7	+ 1.6	- 18.3	+ 8.5	+ 1.2	+ 7.4	- 2.4	+ 3.1	- 6.6	+ 5.4	- 0.2
	30	56.2	Sunday.	- 6.2	- 13.6	+ 1.3	- 12.4	+ 8.7	Sunday.	- 1.6	- 4.7	- 8.6	- 4.0	Sunday.	- 4.6
	31	56.5	+ 0.7	- 2.2	- 16.2	- 1.9	- 3.1	Sunday.	- 10.4	- 7.9	- 3.0	- 8.2	+ 0.9	- 2.9	- 4.9

June.	1	56.9	+ 3.7	- 3.4	- 16.8	+ 2.9	Sunday.	+ 8.0	- 2.6	- 4.2	- 2.2	- 4.1	Sunday.	- 2.0	- 2.1
	2	57.2	+ 6.9	+ 1.2	- 13.8	Sunday.	+ 5.1	+ 2.7	- 2.8	+ 5.6	- 0.3	Sunday.	- 2.6	+ 10.3	+ 1.3
	3	57.5	- 1.0	- 1.3	- 9.6	- 4.4	+ 5.4	+ 5.4	- 1.7	+ 6.6	Sunday.	+ 4.2	- 7.1	+ 3.5	0.0
	4	57.8	+ 9.5	+ 0.8	Sunday.	- 2.4	+ 6.5	+ 3.5	- 6.6	Sunday.	+ 1.6	+ 6.4	- 3.2	- 7.0	+ 0.9
	5	58.1	+ 12.7	Sunday.	- 11.1	+ 1.8	- 1.6	- 5.3	- 5.4	- 1.5	- 4.2	+ 5.6	- 5.4	- 5.0	- 2.2
	6	58.4	Sunday.	- 12.6	- 11.3	+ 3.4	- 6.6	- 7.9	Sunday.	- 8.4	- 1.7	+ 12.9	- 5.4	Sunday.	- 4.2
	7	58.7	+ 11.6	- 8.8	- 7.1	- 4.6	- 5.1	Sunday.	+ 1.2	- 3.6	- 1.3	+ 13.0	- 1.8	- 1.9	- 0.8
	8	59.0	+ 13.8	- 10.7	- 5.5	- 6.9	Sunday.	- 2.9	- 1.8	- 0.8	- 5.5	+ 7.3	Sunday.	- 1.7	- 1.5
	9	59.4	+ 6.8	- 4.0	+ 3.1	Sunday.	+ 10.2	- 1.0	+ 7.4	+ 6.2	- 3.6	Sunday.	- 5.9	- 1.9	+ 1.7
	10	59.7	+ 10.8	- 17.9	- 12.1	- 10.4	+ 6.7	+ 4.0	+ 2.1	+ 4.7	Sunday.	- 4.3	- 2.7	- 11.7	- 2.8
	11	59.9	+ 6.0	- 23.2	Sunday.	- 7.8	+ 3.6	+ 0.2	- 3.5	Sunday.	- 2.6	- 3.7	- 2.1	- 5.9	- 3.9
	12	60.2	- 6.4	Sunday.	- 3.2	- 4.7	+ 4.9	- 3.0	- 2.5	- 10.6	- 7.0	+ 6.3	- 3.0	- 4.5	- 3.1
	13	60.5	Sunday.	- 7.5	- 2.2	- 3.0	+ 2.6	- 1.2	Sunday.	- 8.0	- 0.8	+ 4.0	- 4.1	Sunday.	- 2.2
	14	60.8	- 0.7	- 6.4	- 3.3	- 0.2	+ 3.9	Sunday.	- 14.8	- 5.0	+ 0.1	+ 4.2	- 1.9	+ 9.5	- 1.3
	15	61.1	- 4.2	- 2.9	- 8.6	+ 0.3	Sunday.	+ 7.7	- 12.0	+ 16.8	+ 3.8	- 1.2	Sunday.	+ 13.2	+ 1.3
	16	61.3	- 1.5	- 0.7	- 4.9	Sunday.	- 8.7	+ 0.9	- 10.6	+ 14.1	+ 3.0	Sunday.	- 3.9	+ 12.9	+ 0.1
	17	61.6	- 2.7	- 5.2	- 3.5	+ 2.1	- 7.4	+ 4.8	- 6.3	+ 10.7	Sunday.	+ 1.3	- 4.8	+ 6.4	- 0.4
	18	61.9	- 2.8	+ 0.3	Sunday.	+ 8.2	- 4.3	+ 7.1	- 2.4	Sunday.	+ 4.8	+ 9.9	- 3.8	+ 5.1	+ 2.2
	19	62.1	+ 0.4	Sunday.	- 3.7	+ 5.0	- 2.6	+ 7.3	- 5.1	+ 6.1	+ 9.2	+ 11.0	+ 1.2	+ 0.4	+ 2.7
	20	62.4	Sunday.	- 6.7	+ 3.1	- 0.8	+ 1.6	- 6.2	Sunday.	+ 1.5	+ 12.2	+ 8.4	+ 2.8	Sunday.	+ 1.8
	21	62.6	+ 2.3	- 2.0	+ 6.2	- 2.4	+ 0.4	Sunday.	- 3.2	- 0.7	+ 12.0	+ 4.8	+ 0.2	+ 0.5	+ 1.6
	22	62.9	+ 7.7	- 1.3	+ 6.4	- 3.0	Sunday.	- 2.9	- 4.0	+ 1.1	+ 8.1	+ 0.3	Sunday.	- 2.5	+ 1.0
	23	63.1	+ 7.2	- 6.5	+ 4.2	Sunday.	+ 5.5	+ 3.6	- 0.7	+ 1.0	+ 5.0	Sunday.	+ 0.2	- 4.6	+ 1.5
	24	63.3	+ 3.5	- 5.0	+ 2.5	+ 3.9	+ 5.6	+ 6.5	+ 1.6	+ 0.3	Sunday.	- 0.6	- 1.7	- 8.7	+ 0.7
	25	63.5	+ 3.0	- 7.2	Sunday.	+ 6.2	- 6.0	+ 8.8	+ 1.9	Sunday.	+ 3.3	- 4.1	+ 0.5	- 5.7	+ 0.1
	26	63.8	+ 5.9	Sunday.	+ 3.5	- 0.9	- 3.7	+ 6.1	+ 5.6	+ 5.9	+ 4.9	- 0.3	+ 4.0	+ 0.1	+ 2.8
	27	64.0	Sunday.	- 2.5	+ 7.2	- 3.4	- 0.2	+ 1.4	Sunday.	+ 6.3	+ 6.8	- 3.4	+ 0.3	Sunday.	+ 1.4
	28	64.2	+ 7.5	- 3.4	+ 3.9	- 4.2	- 7.5	Sunday.	+ 1.6	+ 1.5	+ 2.1	+ 0.3	+ 1.3	- 1.1	+ 0.2
	29	64.4	+ 14.3	- 3.3	+ 3.0	- 3.3	Sunday.	+ 5.1	- 1.0	+ 0.2	+ 2.9	+ 4.2	Sunday.	- 1.1	+ 2.1
	30	64.5	+ 6.2	+ 1.3	+ 5.8	Sunday.	- 9.8	+ 8.1	- 1.7	+ 4.2	+ 5.0	Sunday.	+ 2.8	- 0.8	+ 2.1

TABLE IV. (Continued.)

		Daily temperature derived from the monthly means of the 12 years.	Difference on each day of the twelve years from the temperature derived from the monthly means.												Mean daily difference.
		1841.	1842.	1843.	1844.	1845.	1846.	1847.	1848.	1849.	1850.	1851.	1852.		
		(1.)	(2.)	(3.)	(4.)	(5.)	(6.)	(7.)	(8.)	(9.)	(10.)	(11.)	(12.)	(13.)	(14.)
July.	1	64.7	+3.0	-5.6	+10.4	+4.1	-8.3	+5.5	+1.3	-8.5	Sunday.	+3.1	-4.0	-7.7	-0.6
	2	64.9	-5.1	-5.6	Sunday.	+1.4	-7.2	+1.8	+3.1	Sunday.	-3.7	+3.5	-7.3	-6.1	-2.5
	3	65.1	-5.4	Sunday.	-7.5	-6.4	-7.8	-1.9	+5.9	-5.6	-2.7	+5.0	-8.0	-6.0	-3.7
	4	65.2	Sunday.	-3.3	-2.7	-9.6	-8.2	+2.9	Sunday.	-4.4	-0.7	+4.9	-2.8	Sunday.	-2.6
	5	65.3	+2.3	-7.9	-5.2	-5.4	-2.5	Sunday.	+6.8	-2.7	-1.8	+4.7	-0.6	-2.0	-1.3
	6	65.5	-4.9	-10.1	-0.9	+4.1	Sunday.	+4.1	+3.6	-1.1	+0.1	+1.3	Sunday.	+2.0	-0.2
	7	65.6	-4.6	-5.6	-0.3	Sunday.	+5.5	+1.1	+5.9	-4.1	+4.0	Sunday.	-4.0	+7.3	+0.5
	8	65.7	-1.3	-5.5	+4.6	-3.1	+4.8	+2.9	+7.9	-8.4	Sunday.	-2.5	-5.2	+10.2	+0.4
	9	65.9	-1.4	-6.2	Sunday.	+2.0	-3.2	+6.7	+7.6	Sunday.	+6.6	-2.2	+0.5	+3.6	+1.4
	10	66.0	-5.1	Sunday.	-4.0	+2.8	-0.5	+12.5	+6.4	-2.6	+10.8	-0.5	-2.0	+6.0	+2.2
	11	66.1	Sunday.	-3.5	-10.7	+1.1	+7.1	+8.9	Sunday.	+0.9	+10.7	+3.0	-3.9	Sunday.	+1.5
	12	66.2	-0.9	+2.4	-6.4	+1.7	+15.8	Sunday.	+8.1	+2.1	+12.6	+6.6	-2.0	-3.8	+3.3
	13	66.3	+3.2	+4.7	-3.2	+1.1	Sunday.	-3.0	+4.0	+5.2	+12.1	+1.2	Sunday.	-2.8	+2.2
	14	66.3	+6.3	+2.0	+2.7	Sunday.	+9.7	-10.2	-3.6	+4.2	-4.6	Sunday.	+2.3	+0.8	+1.0
	15	66.4	-2.0	-1.4	-1.2	-3.1	+8.2	-9.2	+1.2	-0.5	Sunday.	+8.4	-0.6	-0.7	-0.1
	16	66.5	-5.9	+0.1	Sunday.	-3.5	+10.7	-8.3	+7.0	Sunday.	-1.6	+6.8	+6.1	-1.5	+1.0
	17	66.6	-4.4	Sunday.	+1.1	-2.6	+7.0	-5.2	+8.0	-2.6	+0.8	+5.2	+6.2	+2.6	+1.5
	18	66.6	Sunday.	+5.4	+5.2	+1.1	-0.5	-1.8	Sunday.	+2.9	+3.6	-2.2	-1.5	Sunday.	+1.4
	19	66.7	+1.7	+4.8	-6.9	+0.2	-2.5	Sunday.	+10.6	+3.0	+7.2	-0.9	-3.3	-5.6	+0.8
	20	66.7	+0.6	-6.0	-9.4	-1.7	Sunday.	+5.9	+7.0	+6.5	+2.5	+3.0	Sunday.	+2.4	+1.1
	21	66.7	+4.4	-6.9	-4.3	Sunday.	+6.4	+2.6	+6.0	+3.9	-0.4	Sunday.	-2.2	+10.0	+1.9
	22	66.8	+8.7	+0.3	+0.3	+3.9	+0.8	-1.1	+0.2	-3.6	Sunday.	+3.2	-0.2	+8.0	+1.9
	23	66.8	+7.1	+4.5	Sunday.	+1.2	-4.7	+4.8	-3.0	Sunday.	-1.7	+2.6	+2.9	+2.3	+1.6
	24	66.8	+4.3	Sunday.	+0.1	-1.9	-6.8	-0.8	-2.9	+0.3	+2.3	+8.2	-0.9	-1.2	+0.1
	25	66.9	Sunday.	-6.9	-2.5	-3.9	-2.1	+4.8	Sunday.	-3.1	0.0	-1.1	+2.8	Sunday.	-1.3
	26	66.9	-3.8	+4.8	+0.7	-5.0	+0.8	Sunday.	-12.5	-0.2	+3.1	-7.5	+4.9	+0.8	-1.4
	27	66.9	-4.0	+4.0	-1.8	-2.8	Sunday.	-0.7	-10.8	-1.3	-4.6	-7.1	Sunday.	-3.9	-3.3
	28	66.9	-9.5	-2.6	+3.9	Sunday.	-3.8	+2.1	-8.5	-1.6	-2.7	Sunday.	-0.2	-0.1	-2.3
	29	66.9	-4.7	+3.9	-7.1	+3.6	-5.2	+8.5	-2.6	-3.2	Sunday.	+4.6	-5.2	+6.0	-0.1
	30	66.9	-8.8	-5.7	Sunday.	+2.4	-11.4	+8.0	-7.5	Sunday.	+4.6	+1.1	-5.3	-0.6	-2.3
	31	66.9	-8.4	Sunday.	-5.6	+5.3	-7.9	+1.0	-5.9	0.0	-6.0	+1.9	-4.2	-10.5	-3.7
August.	1	66.9	Sunday.	-11.0	-8.2	+1.2	-7.8	+2.0	Sunday.	-5.9	-3.9	+3.0	-5.1	Sunday.	-4.0
	2	66.8	-4.2	-7.7	-6.5	-1.3	-5.4	Sunday.	-4.0	-1.3	-0.4	+3.1	-2.5	-9.4	-3.6
	3	66.8	+1.2	-7.7	-2.1	-3.7	Sunday.	+3.2	-3.6	+1.2	+3.0	+1.8	Sunday.	-5.8	-1.3
	4	66.8	+0.3	-4.5	+1.4	Sunday.	-0.2	+8.4	-0.6	+0.2	-1.8	Sunday.	-4.4	-2.9	-0.4
	5	66.8	-1.6	+0.2	+2.0	-3.0	+1.4	+11.6	+0.5	-3.0	Sunday.	+6.2	-2.9	-4.0	+0.7
	6	66.8	-3.8	-3.8	Sunday.	-4.2	+1.5	+6.1	+2.2	Sunday.	+0.3	+5.2	-0.2	-4.5	-0.1
	7	66.7	-3.5	Sunday.	+2.5	-0.4	+5.2	+5.9	-2.3	-1.9	-1.8	+6.6	+2.4	+0.2	+1.2
	8	66.7	Sunday.	-1.0	-0.7	+3.2	+2.4	+0.4	Sunday.	-0.1	-0.7	+3.3	-2.4	Sunday.	+0.5
	9	66.6	-1.8	-3.7	-2.4	+3.1	+5.8	Sunday.	+11.4	+5.1	+0.8	+4.1	-3.7	-1.0	+1.6
	10	66.6	-3.8	-2.6	+0.8	-3.3	Sunday.	+0.5	+3.6	+7.4	-7.2	-0.4	Sunday.	-2.8	-0.8
	11	66.5	-8.1	-1.5	+1.1	Sunday.	+2.1	-2.6	-1.0	+6.9	-4.6	Sunday.	-1.3	-3.3	-1.2
	12	66.4	-5.9	+1.7	+3.9	-8.1	-0.5	+5.8	+1.9	+6.3	Sunday.	+6.7	+2.1	-1.3	+1.1
	13	66.3	-1.7	+0.3	Sunday.	-4.3	-3.3	+6.6	+4.2	Sunday.	-0.5	-2.6	+2.6	+0.2	+0.2
	14	66.3	-5.2	Sunday.	+2.2	-2.1	-2.1	+3.2	+4.9	+11.3	-3.3	-2.2	-7.3	+2.7	+0.2
	15	66.2	Sunday.	+1.6	-2.2	+0.5	+0.1	+6.6	Sunday.	+6.7	-4.3	-5.5	-8.8	Sunday.	-0.6
	16	66.1	+1.9	+3.5	+3.6	+4.7	+2.9	Sunday.	+7.0	+4.8	-1.9	-5.9	-6.7	-8.6	+0.5
	17	66.0	+4.0	+3.9	+2.0	+1.0	Sunday.	-2.7	+0.7	-2.6	+0.6	-7.1	Sunday.	-4.4	-0.5
	18	65.9	+4.3	+2.3	-3.2	Sunday.	+6.3	-8.7	-9.1	+0.1	+3.9	Sunday.	-6.0	0.0	-1.0
	19	65.8	-1.4	-1.5	-4.5	+4.8	+1.1	-2.6	-8.1	-0.3	Sunday.	-2.1	-6.3	+5.3	-1.4
	20	65.6	-0.8	-5.3	Sunday.	-2.6	+4.4	-2.2	-4.7	Sunday.	+2.9	-3.6	-4.3	+2.5	-1.2
	21	65.5	+1.3	Sunday.	-4.3	-4.7	+6.9	+2.0	-2.3	-2.0	+3.8	-2.8	+0.5	+3.3	+0.2
	22	65.4	Sunday.	-2.7	-3.0	+0.2	+3.1	-0.5	Sunday.	+1.2	+0.9	-1.6	+2.7	Sunday.	0.0
	23	65.2	-6.5	-0.2	-2.2	-3.0	+7.2	Sunday.	-5.7	+4.6	+2.7	+1.2	+2.1	+7.8	+0.7
	24	65.0	-5.6	+1.8	-3.1	-6.5	Sunday.	-4.6	-3.6	+3.3	+2.6	+1.9	Sunday.	+7.2	-0.7
	25	64.8	-2.6	+6.6	-0.5	Sunday.	+4.0	+0.4	-2.9	+3.1	+4.8	Sunday.	-0.8	+6.4	+1.9
	26	64.6	-2.7	+6.8	+4.8	-6.7	+3.0	+1.3	+1.6	+2.7	Sunday.	-3.9	-8.7	+6.6	+0.4
	27	64.4	-0.9	+6.0	Sunday.	-7.4	-3.6	+3.2	-6.3	Sunday.	+4.2	-9.8	-9.3	-1.0	-2.5
	28	64.2	+1.4	Sunday.	+3.7	-5.7	-1.6	+3.7	-3.8	+5.7	-2.5	-2.7	-5.5	-3.1	-0.9
	29	63.9	Sunday.	+1.7	+3.1	-4.7	+6.2	+2.4	Sunday.	+3.8	+4.2	+0.1	-1.3	Sunday.	+1.7
	30	63.7	-0.6	-1.1	+6.9	-1.6	+3.3	Sunday.	-0.9	+6.0	+6.7	+4.1	+5.3	-1.0	+2.5
	31	63.4	-0.2	+4.3	+10.1	+1.5	Sunday.	+8.0	-8.9	+6.4	-5.8	+7.3	Sunday.	+2.9	+2.6

TABLE IV. (Continued.)

		Daily temperature derived from the monthly mean of the 12 years.	Difference on each day of the twelve years from the temperature derived from the monthly means.												Mean daily difference.
		1841.	1842.	1843.	1844.	1845.	1846.	1847.	1848.	1849.	1850.	1851.	1852.		
		(1.)	(2.)	(3.)	(4.)	(5.)	(6.)	(7.)	(8.)	(9.)	(10.)	(11.)	(12.)	(13.)	(14.)
September.	1	63.1	+ 4.1	+ 10.7	+ 8.5	Sunday.	+ 0.7	+ 10.8	+ 5.2	+ 1.8	- 8.1	Sunday.	+ 0.8	+ 7.8	+ 4.2
	2	62.8	+ 7.1	+ 0.6	+ 9.7	+ 4.2	+ 2.0	+ 11.6	+ 0.2	+ 1.0	Sunday.	- 3.6	+ 1.7	+ 8.8	+ 3.9
	3	62.5	+ 5.7	- 6.0	Sunday.	+ 0.4	+ 4.6	+ 8.3	+ 0.5	Sunday.	- 2.2	- 0.5	0.0	+ 1.8	+ 1.3
	4	62.2	+ 4.6	Sunday.	+ 7.5	- 1.5	+ 2.4	+ 10.8	- 5.8	+ 7.9	+ 3.7	+ 2.7	+ 1.4	- 2.5	+ 2.8
	5	61.9	Sunday.	- 2.7	+ 1.3	- 3.2	- 3.8	+ 9.7	Sunday.	+ 1.0	+ 6.9	- 2.4	+ 5.4	Sunday.	+ 1.4
	6	61.5	+ 6.9	- 1.0	+ 4.6	+ 0.1	- 2.3	Sunday.	- 2.9	- 4.0	- 5.4	- 3.7	+ 6.3	+ 4.9	+ 0.3
	7	61.2	+ 8.1	+ 2.0	+ 4.9	+ 0.2	Sunday.	+ 12.5	+ 1.7	- 0.9	- 11.0	- 0.7	Sunday.	+ 4.5	+ 2.1
	8	60.8	+ 8.4	- 6.3	+ 1.1	Sunday.	- 8.9	+ 1.4	+ 3.9	+ 2.0	- 10.0	Sunday.	+ 10.1	+ 3.8	+ 0.6
	9	60.4	+ 9.4	- 8.1	- 7.7	+ 3.7	- 3.6	+ 0.3	- 7.7	- 4.7	Sunday.	- 2.6	+ 9.2	+ 7.1	- 0.4
	10	60.1	+ 8.2	- 3.7	Sunday.	+ 4.5	- 6.7	+ 3.8	- 5.2	Sunday.	- 3.5	- 2.8	+ 13.7	+ 9.0	+ 1.7
	11	59.7	- 3.5	Sunday.	- 8.6	+ 4.5	- 8.2	+ 10.7	- 4.6	- 1.4	- 0.5	- 5.7	+ 13.3	+ 4.7	+ 0.1
	12	59.3	Sunday.	- 0.9	- 7.9	+ 2.7	- 7.4	+ 9.3	Sunday.	- 7.1	+ 2.3	- 11.6	+ 15.6	Sunday.	- 0.6
	13	58.9	- 3.2	- 1.4	- 1.7	+ 0.7	- 3.7	Sunday.	- 9.6	- 5.9	+ 3.1	- 8.2	- 3.0	- 11.5	- 4.0
	14	58.4	- 3.9	- 0.4	- 2.6	+ 7.0	Sunday.	+ 14.7	- 12.7	- 3.3	+ 4.1	- 8.7	Sunday.	- 9.0	- 1.5
	15	58.0	+ 3.0	+ 1.8	+ 3.0	Sunday.	- 1.0	- 1.2	- 9.3	- 8.6	+ 5.0	Sunday.	- 10.5	- 9.4	- 2.7
	16	57.6	+ 5.7	- 2.5	+ 3.5	+ 8.1	- 9.2	+ 1.5	- 5.4	- 6.9	Sunday.	- 2.1	- 7.0	- 8.9	- 2.1
	17	57.1	+ 3.8	- 3.5	Sunday.	+ 10.9	+ 1.4	+ 1.2	+ 1.2	Sunday.	+ 4.7	+ 2.8	- 5.2	- 5.9	+ 1.1
	18	56.7	- 6.7	Sunday.	+ 5.8	+ 1.9	+ 3.5	+ 2.0	+ 1.4	- 0.1	- 1.0	+ 2.9	+ 1.4	- 0.1	+ 1.0
	19	56.2	Sunday.	- 10.0	+ 2.9	+ 8.7	- 1.3	+ 6.9	Sunday.	+ 3.1	- 4.0	- 3.0	+ 5.9	Sunday.	+ 1.0
	20	55.7	+ 4.3	- 2.2	+ 4.9	+ 13.9	- 3.6	Sunday.	- 0.8	- 4.1	+ 0.7	- 2.2	+ 9.7	- 2.8	+ 1.6
	21	55.2	+ 8.0	- 11.4	+ 12.2	+ 2.8	Sunday.	- 3.6	- 1.9	- 9.5	+ 4.6	+ 1.7	Sunday.	+ 5.5	+ 0.8
	22	54.7	+ 11.1	- 17.6	- 0.1	Sunday.	- 6.0	- 0.9	- 2.3	- 14.3	+ 7.6	Sunday.	- 2.7	- 1.7	- 2.7
	23	54.3	+ 7.4	- 10.5	+ 11.4	- 5.9	- 5.1	+ 10.2	+ 5.7	- 4.9	Sunday.	+ 12.5	+ 4.4	- 4.3	+ 1.9
	24	53.8	+ 6.3	- 7.0	Sunday.	- 5.4	- 6.1	+ 4.9	+ 0.1	Sunday.	+ 0.3	+ 8.3	- 10.5	+ 0.9	- 0.8
	25	53.3	+ 4.3	Sunday.	- 0.1	- 7.2	- 3.4	- 1.5	- 0.6	- 3.7	+ 6.9	- 2.2	- 4.6	+ 2.0	- 0.9
	26	52.8	Sunday.	- 3.6	- 9.0	- 9.8	- 3.1	+ 0.3	Sunday.	- 14.2	- 3.7	- 2.0	+ 3.8	Sunday.	- 4.6
	27	52.3	- 2.6	+ 6.3	- 11.6	- 11.9	- 3.5	Sunday.	+ 7.2	- 5.2	- 4.8	0.0	- 7.7	- 5.7	- 3.6
	28	51.9	- 2.0	+ 5.2	- 7.2	- 8.6	Sunday.	+ 1.2	- 2.8	- 8.0	+ 5.9	- 1.1	Sunday.	- 4.0	- 2.1
	29	51.4	- 4.1	+ 6.1	+ 0.1	Sunday.	+ 12.1	+ 9.3	- 4.9	- 0.7	+ 2.8	Sunday.	+ 1.2	- 7.3	+ 1.4
	30	50.9	- 5.3	+ 5.3	+ 3.1	- 5.4	+ 6.7	+ 10.9	- 2.1	- 8.0	Sunday.	- 5.1	- 2.2	- 0.5	- 0.2
October.	1	50.5	- 9.1	+ 5.3	Sunday.	- 6.2	- 0.2	- 0.5	- 4.7	Sunday.	- 1.9	+ 1.1	- 3.2	+ 3.0	- 1.6
	2	50.0	- 6.7	Sunday.	+ 2.0	+ 4.4	+ 4.9	- 4.1	- 2.0	- 1.9	- 5.0	- 6.6	+ 3.4	+ 9.6	- 0.2
	3	49.6	Sunday.	- 1.8	- 3.0	+ 1.3	+ 3.2	- 2.1	Sunday.	+ 5.0	- 0.5	- 3.4	+ 2.7	Sunday.	+ 0.2
	4	49.1	- 4.6	- 5.1	- 3.7	+ 1.2	+ 2.5	Sunday.	+ 6.0	+ 4.7	+ 1.6	+ 2.5	- 1.2	+ 5.9	+ 0.9
	5	48.7	- 2.7	- 4.8	+ 0.8	- 0.9	Sunday.	+ 3.7	+ 10.7	+ 4.0	- 1.3	+ 2.2	Sunday.	+ 2.6	+ 1.4
	6	48.3	- 2.2	- 3.7	+ 8.0	Sunday.	- 6.9	+ 7.4	+ 8.8	+ 0.3	- 0.9	Sunday.	+ 2.0	+ 9.0	+ 2.2
	7	47.9	0.0	+ 6.7	+ 5.1	- 10.1	+ 1.9	+ 15.3	+ 7.8	+ 3.3	Sunday.	- 10.2	+ 5.9	+ 6.7	+ 2.9
	8	47.5	- 2.2	+ 6.3	Sunday.	+ 4.8	+ 7.5	+ 11.5	+ 5.8	Sunday.	- 1.4	+ 0.9	+ 8.0	+ 9.2	+ 5.0
	9	47.1	- 1.6	Sunday.	- 3.5	+ 7.7	+ 8.4	+ 5.3	+ 4.0	+ 5.1	+ 3.6	+ 7.4	+ 8.3	+ 6.1	+ 4.6
	10	46.7	Sunday.	+ 1.0	- 0.7	+ 1.5	+ 10.4	- 6.0	Sunday.	- 1.8	- 2.2	+ 7.8	+ 9.1	Sunday.	+ 2.1
	11	46.3	+ 5.1	+ 9.3	+ 3.1	- 4.3	+ 6.1	Sunday.	- 2.8	- 6.1	+ 0.1	+ 7.7	+ 11.0	+ 3.6	+ 3.0
	12	46.0	- 2.4	+ 0.8	- 3.1	- 2.0	Sunday.	+ 10.3	- 2.9	- 3.9	+ 2.0	- 1.7	Sunday.	+ 1.5	- 0.1
	13	45.6	- 4.1	0.0	- 7.4	Sunday.	+ 4.5	- 0.1	- 6.1	- 1.7	- 4.1	Sunday.	+ 9.7	- 4.4	- 1.4
	14	45.3	+ 2.3	+ 1.0	- 8.5	+ 2.5	- 3.6	- 0.9	- 10.8	+ 5.2	Sunday.	- 6.3	+ 2.3	- 1.7	- 1.7
	15	44.9	+ 2.2	- 1.7	Sunday.	+ 0.2	- 9.9	- 0.8	- 4.5	Sunday.	+ 4.8	- 2.0	- 4.2	- 6.0	- 2.2
	16	44.6	- 6.8	Sunday.	- 3.5	- 1.6	- 6.3	+ 5.0	+ 5.3	+ 10.6	+ 8.7	+ 8.7	- 8.0	- 8.0	+ 0.4
	17	44.3	Sunday.	- 0.1	- 5.0	- 2.0	- 3.0	- 11.0	Sunday.	- 8.7	+ 5.1	+ 10.7	- 1.3	Sunday.	- 1.7
	18	44.1	- 8.5	- 5.8	- 3.4	+ 0.1	+ 3.8	Sunday.	+ 8.9	- 9.2	- 0.4	- 1.2	+ 8.6	+ 11.2	+ 0.4
	19	43.8	- 3.6	- 5.1	- 3.6	- 6.1	Sunday.	- 1.1	- 0.9	- 3.3	- 3.7	- 2.4	Sunday.	- 0.4	- 3.0
	20	43.6	- 4.2	- 6.2	+ 8.9	Sunday.	- 9.9	- 3.4	- 2.3	- 1.4	- 2.7	Sunday.	+ 9.7	- 1.7	- 1.3
	21	43.3	- 4.5	- 0.8	- 1.1	- 1.9	- 14.7	- 5.0	- 2.2	- 3.3	Sunday.	+ 0.2	+ 1.6	+ 5.1	- 2.4
	22	43.0	- 7.6	+ 3.5	Sunday.	+ 0.5	- 12.0	- 12.0	- 4.4	Sunday.	+ 6.0	+ 5.6	- 2.7	+ 2.1	- 2.1
	23	42.8	- 9.0	Sunday.	- 10.4	+ 0.1	- 1.2	- 6.4	- 0.8	- 0.7	+ 2.8	+ 2.0	- 2.2	- 2.6	- 2.6
	24	42.5	Sunday.	+ 8.4	- 6.6	+ 5.4	+ 1.9	- 3.4	Sunday.	+ 5.3	- 2.3	- 1.0	+ 3.1	Sunday.	+ 1.2
	25	42.3	- 11.2	- 1.4	- 5.5	+ 7.2	+ 2.6	Sunday.	- 3.5	+ 2.2	+ 3.3	- 3.1	- 6.4	+ 2.8	- 1.2
	26	42.0	- 3.7	- 1.4	- 7.3	+ 0.6	Sunday.	+ 7.1	- 15.4	- 0.4	+ 3.5	- 2.7	Sunday.	- 2.9	- 2.3
	27	41.8	- 9.9	- 4.6	- 10.8	Sunday.	+ 6.0	+ 1.0	- 11.6	+ 3.0	+ 2.4	Sunday.	- 9.8	+ 5.6	- 2.9
	28	41.5	- 5.2	+ 2.2	- 6.6	- 13.5	+ 7.4	- 8.1	- 7.2	+ 7.4	Sunday.	+ 2.9	- 1.6	+ 11.1	- 1.0
	29	41.3	+ 3.0	+ 2.4	Sunday.	- 12.5	+ 12.8	- 1.0	- 1.5	Sunday.	+ 7.1	- 8.2	+ 8.1	+ 6.2	+ 1.6
	30	41.0	+ 8.5	Sunday.	- 9.1	- 10.7	+ 11.1	- 5.4	+ 1.4	+ 9.7	- 3.9	- 4.1	+ 10.4	+ 5.4	+ 1.2
	31	40.8	Sunday.	- 1.4	- 7.7	- 10.9	+ 11.9	- 5.1	Sunday.	+ 2.1	- 10.9	+ 3.1	+ 1.4	Sunday.	- 1.9

TABLE IV. (Continued.)

		Daily temperature derived from the monthly mean of the 12 years.	Difference on each day of the twelve years from the temperature derived from the monthly means.												Mean daily difference.
		1841.	1842.	1843.	1844.	1845.	1846.	1847.	1848.	1849.	1850.	1851.	1852.		
		(1.)	(2.)	(3.)	(4.)	(5.)	(6.)	(7.)	(8.)	(9.)	(10.)	(11.)	(12.)	(13.)	(14.)
November.	1	40.5	+13.2	+3.9	-4.4	-2.3	+7.8	Sunday.	+10.1	-1.7	-4.0	+6.8	+3.5	+3.5	+3.3
	2	40.3	+6.6	-0.5	-5.3	-1.5	Sunday.	+9.8	+11.6	-4.7	+1.2	+5.4	Sunday.	+3.1	+2.6
	3	40.0	+2.4	-4.9	-9.0	Sunday.	+1.5	+7.7	+10.8	-0.3	+6.9	Sunday.	-4.3	+0.5	+1.1
	4	39.8	-3.2	-4.6	-12.8	+0.5	+1.5	+4.9	+3.6	+3.3	Sunday.	+10.4	-8.1	+1.2	-0.3
	5	39.5	-2.2	+0.3	Sunday.	+0.4	+2.0	0.0	-0.9	Sunday.	+13.8	+14.8	-11.0	-0.3	+1.7
	6	39.2	-6.2	Sunday.	-9.4	-0.2	+2.4	+2.0	-6.2	-2.8	+12.6	+4.2	-7.9	+1.8	-0.9
	7	39.0	Sunday.	+5.4	-5.2	+3.9	+0.7	+7.6	Sunday.	-8.7	+10.1	-4.7	-1.9	Sunday.	+0.8
	8	38.7	-0.7	+0.4	-5.6	-4.4	-5.1	Sunday.	+9.4	-8.6	+5.2	-1.7	+0.5	-0.9	-1.0
	9	38.4	-1.1	-2.1	-3.2	-4.5	Sunday.	+13.6	+7.9	-16.3	+6.2	-3.1	Sunday.	-3.0	-0.6
	10	38.1	+0.8	-1.8	-1.3	Sunday.	+1.1	+14.2	-0.5	-12.6	+9.2	Sunday.	-6.5	-3.6	-0.1
	11	37.8	+4.3	+3.1	-3.1	+3.2	+0.2	+12.2	-1.8	-9.0	Sunday.	-0.5	-14.0	+1.1	-0.4
	12	37.5	+3.7	+1.3	Sunday.	+4.8	-1.5	+9.2	-0.7	Sunday.	+5.1	+1.4	-6.8	+0.4	+1.7
	13	37.2	+0.9	Sunday.	-9.5	-3.7	+7.0	+8.7	+0.8	-4.1	+9.0	-0.8	-5.6	-4.3	-0.1
	14	36.9	Sunday.	+0.7	-11.8	-2.9	+4.7	+7.5	Sunday.	-0.2	+6.4	+3.1	-5.0	Sunday.	+0.3
	15	36.5	-6.4	-3.1	-0.9	-0.3	+2.3	Sunday.	+0.6	+0.9	+0.8	+6.1	-3.8	-4.2	-0.7
	16	36.2	-1.8	-1.2	+2.7	+3.2	Sunday.	+8.4	+6.6	+0.6	+4.8	-2.1	Sunday.	-4.5	+1.7
	17	35.8	-4.5	+2.2	+4.0	Sunday.	+9.6	+10.3	+11.7	-2.1	+4.8	Sunday.	-4.0	-4.5	+2.8
	18	35.5	-7.1	-14.0	+4.7	-5.9	+14.3	+10.5	+7.9	-4.9	Sunday.	+0.4	-5.1	-1.2	0.0
	19	35.1	-4.9	-6.8	Sunday.	+0.2	+4.6	+4.1	-8.4	Sunday.	+10.5	+1.4	-3.1	-1.6	-0.4
	20	34.8	-1.6	Sunday.	+3.6	+0.7	+8.9	+3.5	-8.1	-2.5	+9.9	+1.9	+1.4	+0.3	+1.6
	21	34.4	Sunday.	-8.5	+4.4	+2.4	-1.1	+6.1	Sunday.	-0.8	+7.8	-6.0	+3.8	Sunday.	+0.9
	22	34.1	+8.6	-4.1	-2.7	+7.3	+0.3	Sunday.	+7.4	-0.2	+11.6	-6.8	-3.1	-0.7	+1.6
	23	33.7	+1.4	0.0	+5.6	+4.3	Sunday.	+1.2	+15.2	+1.0	+7.2	-1.8	Sunday.	-5.8	+2.8
	24	33.3	+0.6	-4.3	+6.5	Sunday.	-8.4	+0.7	+11.7	+9.0	+8.5	Sunday.	-4.9	-7.6	+1.2
	25	33.0	-5.2	-5.1	+0.9	-12.3	+1.9	-12.8	+3.8	+1.3	Sunday.	+3.8	-3.5	+3.5	-2.2
	26	32.6	-10.7	-7.9	Sunday.	-5.9	-1.6	-7.2	-8.7	Sunday.	+7.7	+3.8	-6.3	+7.4	-2.9
	27	32.2	-8.9	Sunday.	-12.0	-15.7	-14.5	-0.2	-3.9	-2.2	+2.7	+11.5	+1.8	+2.7	-3.5
	28	31.9	Sunday.	-12.9	-6.0	-11.3	-18.1	+6.2	Sunday.	+7.0	-1.3	+4.3	+3.3	Sunday.	-3.2
	29	31.5	-13.4	-11.4	-1.5	-0.9	-11.9	Sunday.	-17.9	+9.3	+0.3	+5.1	+3.4	+1.4	-3.4
	30	31.1	-1.5	-5.2	-4.4	+3.6	Sunday.	-7.4	-5.9	-2.0	+3.7	+5.6	Sunday.	+3.9	-1.0
December.	1	30.8	+3.1	-5.7	-0.2	Sunday.	-12.1	-3.5	+6.1	-3.6	-9.4	Sunday.	-9.2	+4.7	-3.0
	2	30.5	+4.7	+1.5	-0.3	-1.3	-22.3	+10.6	+4.4	+6.4	Sunday.	+1.2	-7.9	+4.3	+0.1
	3	30.1	+9.5	+6.1	Sunday.	+2.7	-9.8	+0.3	+0.5	Sunday.	-0.1	+9.7	-5.6	+10.5	+2.4
	4	29.8	+5.5	Sunday.	+5.4	+5.1	-3.6	+2.4	-0.3	+4.8	+4.1	+5.2	-3.8	+11.3	+3.3
	5	29.4	Sunday.	-4.1	-9.5	+4.3	-6.5	+2.0	Sunday.	+0.2	+5.3	+2.4	-6.0	Sunday.	-1.3
	6	29.1	+0.4	-10.2	-0.5	+6.6	-6.1	Sunday.	+2.0	-1.3	-3.0	+0.6	+0.3	+14.5	+0.3
	7	28.7	+2.2	-3.1	+1.1	+9.5	Sunday.	+9.7	+6.2	+4.1	-4.4	-6.5	Sunday.	+19.0	+3.8
	8	28.5	+10.7	+4.0	+1.5	Sunday.	+0.7	+6.5	+3.1	+12.2	-4.1	Sunday.	+9.3	+10.5	+5.4
	9	28.2	+12.5	-0.1	-0.3	+0.1	+0.6	+3.3	+13.7	+4.5	Sunday.	-2.9	+1.2	+8.4	+3.7
	10	27.9	+13.1	-8.6	Sunday.	-1.1	-13.8	+1.9	+14.5	Sunday.	+0.6	-10.2	+0.6	+5.7	+0.3
	11	27.7	+9.7	Sunday.	+4.9	+1.9	-22.5	-1.7	+5.0	+1.8	-4.5	0.0	-6.4	+5.7	-0.6
	12	27.4	Sunday.	+3.0	-16.0	+7.3	-12.0	-9.0	Sunday.	+0.7	-3.5	-10.5	+3.3	Sunday.	-4.1
	13	27.2	+11.6	-3.9	-3.1	+7.0	+0.1	Sunday.	+6.3	+4.8	+1.1	-16.7	-16.3	+1.2	-0.7
	14	27.0	+13.2	-1.6	+7.9	+5.6	Sunday.	-10.7	+6.0	+10.6	+5.1	-4.1	Sunday.	+0.5	+3.3
	15	26.8	+7.5	-1.7	+7.6	Sunday.	+2.5	-11.3	-1.2	+6.8	+7.0	Sunday.	-12.3	+0.7	+0.6
	16	26.6	-4.6	-5.3	+5.9	-7.7	+1.7	-3.7	-8.8	+12.8	Sunday.	+2.7	-21.8	+9.5	-1.8
	17	26.4	-12.9	-0.9	Sunday.	-9.3	+8.4	-5.1	-5.4	Sunday.	+3.3	-9.8	-21.5	+1.1	-5.2
	18	26.2	-10.5	Sunday.	+4.3	-7.8	+2.2	-0.2	+0.6	+11.2	-1.1	-8.4	-10.1	-0.2	-1.8
	19	26.1	Sunday.	+1.1	+5.2	-9.0	-16.1	+4.0	Sunday.	+11.4	+10.2	-11.1	-5.2	Sunday.	-1.1
	20	25.9	-11.2	-1.8	+9.5	-7.7	-14.4	Sunday.	-14.0	-0.5	+11.9	-3.9	-10.5	-0.3	-3.9
	21	25.8	-17.9	+6.8	+8.7	+1.9	Sunday.	-4.2	-6.3	-10.7	+2.0	+4.8	Sunday.	-9.1	-2.4
	22	25.7	-8.5	-15.2	+8.8	Sunday.	-11.5	-5.3	-4.9	-17.0	+0.4	Sunday.	-12.2	-1.5	-6.7
	23	25.6	+8.0	-12.4	+8.0	+0.4	-4.9	-9.8	-2.7	-6.6	Sunday.	-14.9	-10.5	+7.4	-3.5
	24	25.5	-0.4	-7.6	Sunday.	+6.0	-1.8	+7.4	-5.3	Sunday.	-4.8	-18.5	-2.1	+13.5	-1.4
	25	25.4	Xmas day	Xmas day.	Xmas day.	Xmas day.	Xmas day.	Xmas day.	Xmas day.	Xmas day.	Xmas day.	Xmas day.	Xmas day.	Xmas day.	Xmas day.
	26	25.3	Sunday.	+5.3	+12.1	+10.4	-10.4	+2.6	Sunday.	-4.2	-12.8	+3.2	-24.4	Sunday.	-2.0
	27	25.3	+1.4	+2.5	+11.2	-5.1	-1.0	Sunday.	-5.1	+3.2	-0.2	+1.8	-0.1	+5.5	+1.3
	28	25.2	+5.5	+1.1	+5.9	-2.4	Sunday.	+4.0	+9.5	+1.5	-1.3	-9.5	Sunday.	+6.8	+2.1
	29	25.2	+3.4	+7.4	+1.7	Sunday.	+8.5	+3.9	+15.5	+1.7	-0.5	Sunday.	+11.4	+2.1	+5.5
	30	25.2	+6.9	-3.6	+1.1	+9.3	-2.0	+11.4	+17.5	+1.6	Sunday.	-20.0	+14.0	+3.5	+3.6
	31	25.2	-1.7	-9.7	Sunday.	+8.3	-3.4	+12.5	+18.6	Sunday.	-10.3	-11.0	+7.6	-1.8	+0.9

With a view of assisting the inquiry whether non-periodic variations of a uniform character manifest a tendency to recur at the same epochs in different years, the daily averages in column 14 of Table IV. have been collected in Table V. into "five-day means," each of the five-day means thus represented being the average non-periodic variation in those five-days in twelve years. And for the purpose of supplying a more satisfactory indication of the degree of variability to which the temperature of any single day is subject at different seasons, than can be obtained by the mere inspection of the differences in columns 2 to 13 of Table IV., the "probable daily non-periodic variation" in column 3 of Table V. has been computed for each of the five-day periods, upon the same principle and by the same process that the "probable error" of each of several partial results is derived from their mutual differences; whilst in column 2 is shown the probable non-periodic variation corresponding to the averages of five days in twelve years contained in column 1, bearing a similar analogy to the probable error of the arithmetical mean of a series of partial results.

TABLE V.

Five-day periods.	Non-periodic variations in twelve years averaged in five-day means.	Probable non-periodic variation in the averages of five days in Column 1.	Probable daily non-periodic variation.	Five-day periods.	Non-periodic variations in twelve years averaged in five-day means.	Probable non-periodic variation in the averages of five days in Column 1.	Probable daily non-periodic variation.
	(1.)	(2.)	(3.)		(1.)	(2.)	(3.)
Jan. 3 to 7 inclusive.	-0.7	±0.8	±5.8	July 3 to 7 inclusive.	-1.5	±0.5	±3.4
8 to 12.	-1.1	±0.9	±6.2	8 to 12.	+1.8	±0.6	±4.2
13 to 17.	+2.0	±0.8	±6.1	13 to 17.	+1.1	±0.5	±3.5
18 to 22.	-2.8	±1.1	±7.7	18 to 22.	+1.4	±0.4	±3.1
23 to 27.	+2.0	±0.9	±6.7	23 to 27.	-0.9	±0.4	±3.0
28 to Feb. 1.	-0.7	±1.0	±7.3	28 to Aug. 2.	-2.7	±0.5	±3.7
Feb. 2 to 6.	+1.6	±0.8	±6.0	Aug. 3 to 7.	0.0	±0.4	±2.6
7 to 11.	-1.6	±0.9	±6.3	8 to 12.	+0.2	±0.4	±2.8
12 to 16.	-2.9	±0.9	±6.7	13 to 17.	0.0	±0.4	±3.0
17 to 21.	+1.0	±1.0	±7.0	18 to 22.	-0.7	±0.4	±2.7
22 to 26.	+1.5	±0.9	±6.9	23 to 27.	0.0	±0.4	±3.3
27 to March 3.	-1.4	±0.8	±5.8	28 to Sept. 2.	+2.3	±0.5	±3.6
Mar. 4 to 8.	+2.0	±0.7	±5.0	Sept. 3 to 7.	+1.6	±0.5	±3.4
9 to 13.	+1.8	±0.6	±4.6	8 to 12.	+0.3	±0.7	±4.7
14 to 18.	-1.8	±0.8	±5.6	13 to 17.	-1.8	±0.6	±4.3
19 to 23.	-0.9	±0.7	±5.0	18 to 22.	+0.3	±0.6	±4.2
24 to 28.	+0.9	±0.6	±4.5	23 to 27.	-1.6	±0.6	±4.4
29 to April 2.	-0.6	±0.7	±5.3	28 to Oct. 2.	-0.5	±0.5	±3.7
Apr. 3 to 7.	+0.6	±0.6	±4.0	Oct. 3 to 7.	+1.5	±0.5	±3.6
8 to 12.	-0.1	±0.7	±4.7	8 to 12.	+2.9	±0.5	±3.9
13 to 17.	-1.7	±0.6	±4.6	13 to 17.	-1.3	±0.5	±3.9
18 to 22.	+0.2	±0.6	±4.4	18 to 22.	-1.7	±0.5	±3.9
23 to 27.	+0.5	±0.6	±4.2	23 to 27.	-1.6	±0.5	±3.9
28 to May 2.	-0.2	±0.5	±4.0	28 to Nov. 2.	+1.0	±0.6	±4.9
May 3 to 7.	-0.5	±0.6	±4.3	Nov. 3 to 7.	+0.5	±0.6	±4.3
8 to 12.	+1.1	±0.5	±3.9	8 to 12.	-0.1	±0.6	±4.1
13 to 17.	+1.0	±0.6	±4.0	13 to 17.	+0.8	±0.5	±3.6
18 to 22.	-1.3	±0.6	±4.3	18 to 22.	+0.7	±0.6	±4.2
23 to 27.	+0.3	±0.6	±4.3	23 to 27.	-0.9	±0.7	±4.9
28 to June 2.	-1.2	±0.6	±4.6	28 to Dec. 2.	-2.1	±0.7	±5.3
June 3 to 7.	-0.8	±0.6	±4.4	Dec. 3 to 7.	+1.7	±0.6	±4.4
8 to 12.	-1.9	±0.7	±5.0	8 to 12.	+0.9	±0.8	±5.5
13 to 17.	-0.5	±0.6	±4.6	13 to 17.	-0.8	±0.8	±5.8
18 to 22.	+1.9	±0.5	±3.6	18 to 22.	-3.2	±0.8	±6.0
23 to 27.	+1.3	±0.4	±3.1	23 to 28.	-0.7	±0.9	±5.8
28 to July 2.	+0.3	±0.4	±3.5	29 to Jan. 2.	+2.4	±0.8	±6.1

If we collect the values in column 3 of Table V. into monthly averages, and arrange the months in meteorological seasons, we obtain thereby the following comparison of the probable variability of the daily temperature at different seasons :—

Winter.	Spring.	Summer.	Autumn.
December . . 5°6	March . . . 5°1	June 4°0	September . 4°2
January . . 6°6	April 4°6	July 3°5	October . . . 4°0
February . . 6°6	May 4°2	August . . . 3°0	November . 4°4
Means . . . 6°3	4°6	3°5	4°2

Whence we learn that during the winter months the temperature of a day is as likely to differ from its mean or normal state 6°3 or *more*, as it is to differ *less* than that amount. Regarding 6°3 therefore as the *index of variability* in the winter months, the index in the spring months is 4°6, in the summer months 3°5, and in autumn 4°2. The probable variability is a maximum in the last half of January and first half of February, and a minimum in August; it is progressive from the maximum to the minimum and from the minimum to the maximum, and its amount is about twice as great at the maximum as at the minimum.

The principal variations from the general progression shown in the five-day averages of the twelve years, accompanied in each case by the “probable variability,” are as follows :—

January 18 to 22 inclusive	−2°8	±1°1
February 12 to 16 inclusive	−2°9	±0°9
August 28 to September 2 inclusive . . .	+2°3	±0°5
October 8 to 12 inclusive	+2°9	±0°5
November 28 to December 2 inclusive . .	−2°1	±0°7
December 18 to 22 inclusive	−3°2	±0°8
December 29 to January 2 inclusive . . .	+2°4	±0°8

Of these, more than half, four, occur in the winter season, two in the autumn, and one in the summer. Their connexion with particular winds and with other meteorological circumstances will be more properly examined in the general discussion of the meteorological observations at Toronto in the volumes of that observatory; but it has appeared desirable to bring into immediate notice the principal instances, furnished by the five-day means in twelve years, of such more considerable departures from the regular progression of the temperature, as may be supposed to indicate in some degree a tendency to periodical recurrence.

For the convenience of those who study *monthly* averages, the mean temperatures of every month in each of the twelve years have been collected in Table VI., together with the average temperature of each month in the whole period. By the comparison of these numbers, the amount by which the temperature of any particular month during the twelve years exceeded or fell short of the average may at once be seen.

February and March appear to be months most liable to extreme variations; July and August the least so; the probable variability of the several months is as follows:—

January	$\pm 2^{\circ}7$	April	$\pm 1^{\circ}9$	July . .	$\pm 1^{\circ}1$	October .	$\pm 1^{\circ}4$
February	$\pm 2^{\circ}6$	May .	$+ 1^{\circ}8$	August .	$\pm 1^{\circ}2$	November .	$\pm 2^{\circ}1$
March .	$\pm 2^{\circ}8$	June .	$\pm 2^{\circ}0$	September	$\pm 1^{\circ}8$	December .	$\pm 2^{\circ}5$

The mean *annual* temperature derived from the whole body of the observations in twelve years is $44^{\circ}23$; and on the supposition that no constant errors, instrumental or observational, or occasioned by insufficient protection or defective exposure of the thermometer, are involved, and that the variations of the temperature in different years may be regarded strictly as accidental oscillations around a mean value, and of equally probable occurrence in every year, the probable error of this result is $\pm 0^{\circ}18$. The probable variability of a *single year* is $\pm 0^{\circ}63$; showing that there is an equal probability that the mean temperature of any one year will fall within the limits of $43^{\circ}60$ and $44^{\circ}86$, as that it will exceed those limits; a conclusion which perhaps would scarcely have been anticipated considering the great range of the thermometer in the course of the year, and the magnitude of the non-periodic variations in short intervals. The climate of Toronto presents a remarkable combination of great regularity in the annual temperature with great variability occurring in the course of the year. The mean temperatures of the several years differed from the average mean temperature as follows:—

1841.	$-0^{\circ}31$	1844.	$+0^{\circ}25$	1847.	$-0^{\circ}53$	1850.	$+0^{\circ}22$
1842.	$-0^{\circ}27$	1845.	$+0^{\circ}35$	1848.	$+0^{\circ}85$	1851.	$-0^{\circ}25$
1843.	$-1^{\circ}88$	1846.	$+2^{\circ}13$	1849.	$-0^{\circ}14$	1852.	$-0^{\circ}39$

The excess of cold in 1843 ($1^{\circ}88$) was due chiefly to the occurrence of very low temperatures in February and March of that year; the excess of heat in 1846 ($2^{\circ}13$) was more generally diffused throughout the year, all the months excepting February and October being above their average.

Table VI. exhibits also the normal temperatures of the different months in the geographical latitude, $43^{\circ} 40' N.$, in which Toronto is situated, taken from DOVE'S 'Verbreitung der Wärme,' Berlin, 1852; as well as the 'Thermic Anomaly,' or differences between these normal values and the temperatures observed at Toronto. It appears from this comparison that every month of the year at Toronto is colder than the normal temperature of the parallel in which it is situated, the mean annual temperature being nearly 7° below the normal. The thermic anomaly is least in July and August (between 2° and 3°) and greatest in February, when it exceeds 11° . Its sudden increase in October and decrease in November are deserving of notice. In viewing the bearing of the thermic anomaly at Toronto on the more general question of the thermic anomaly in the part of North America in which it is situated,

it is necessary to bear in mind that the thermometer at Toronto was about 342 feet above the sea-level, equivalent, as usually estimated, to a diminution of rather more than 1° of FAHR. on account of vertical elevation. DOVE's normal temperatures are all reduced to the sea-level, and when the monthly temperatures at Toronto have undergone the same reduction, the thermic anomaly indicated by them is diminished to about 1° in July and August, but in February still reaches the large amount of 10° ; in both respects therefore confirming DOVE's conclusion, that the summers of North America are *not* warmer than is due to their latitude, whilst the winters are *much* colder.

TABLE VI.

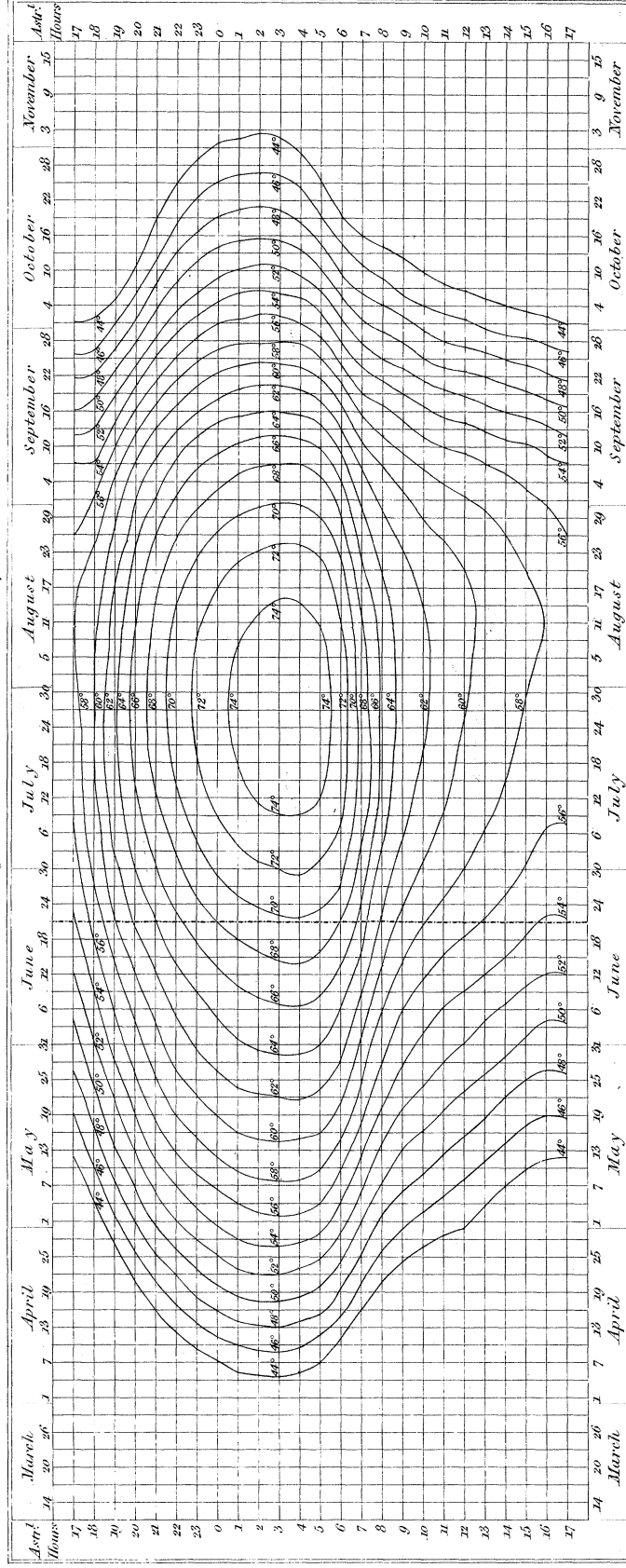
Showing the mean monthly and annual temperatures in each of the twelve years from 1841 to 1852 inclusive, and the average monthly and annual temperatures in the whole period. Also the mean or normal temperature of the several months in the latitude of $43^{\circ} 40' N.$, taken from DOVE's 'Verbreitung der Wärme,' and the 'Thermic Anomaly,' shown by the observations at Toronto.

Years.	January.	Feb.	March.	April.	May.	June.	July.	August.	Sept.	Oct.	Nov.	Dec.	Mean annual temperature.
1841.	25.6	22.4	27.7	39.2	50.5	65.6	65.0	64.4	61.3	41.6	35.0	28.7	43.92
1842.	27.9	26.9	35.8	43.1	49.1	55.6	64.7	65.7	55.7	45.1	33.3	24.7	43.96
1843.	28.7	14.5	21.3	40.9	49.1	58.4	64.5	66.4	59.1	41.8	33.5	30.0	42.35
1844.	20.2	26.0	31.3	47.5	53.6	59.9	66.0	64.3	58.6	43.3	34.9	28.2	44.48
1845.	26.5	26.0	35.4	42.1	49.6	61.0	66.2	67.9	56.0	46.4	36.8	21.1	44.58
1846.	26.7	20.4	33.1	44.0	55.5	63.3	68.0	68.4	63.6	44.6	41.3	27.5	46.36
1847.	23.3	21.5	26.2	39.2	54.4	58.4	68.0	65.1	55.6	44.0	38.6	30.1	43.70
1848.	28.7	26.6	28.6	41.3	54.1	62.9	65.5	69.2	54.2	46.3	34.5	29.1	45.08
1849.	18.5	19.5	33.5	39.0	48.0	63.2	68.4	66.3	58.2	45.3	42.6	26.5	44.09
1850.	29.7	26.0	29.8	37.9	47.6	64.3	68.9	66.8	56.5	45.4	38.8	21.7	44.45
1851.	25.5	27.6	32.4	41.3	51.3	59.2	65.0	63.6	60.0	47.4	32.9	21.5	43.98
1852.	18.4	23.4	27.7	38.2	51.4	60.8	66.8	65.9	57.5	48.0	36.0	31.9	43.84
Means in 12 years.	24.97	23.40	30.23	41.14	51.18	61.05	66.41	66.16	58.02	44.93	36.51	26.75	44.23
Normal temperatures in latitude $43^{\circ} 40' N.$	32.8	34.7	40.1	50.2	58.1	64.6	68.7	68.5	61.5	53.8	43.2	36.0	51.0
'Thermic Anomaly' at Toronto.	-7.8	-11.3	-9.9	-9.1	-6.9	-3.5	-2.3	-2.3	-3.5	-8.9	-6.7	-9.2	-6.8

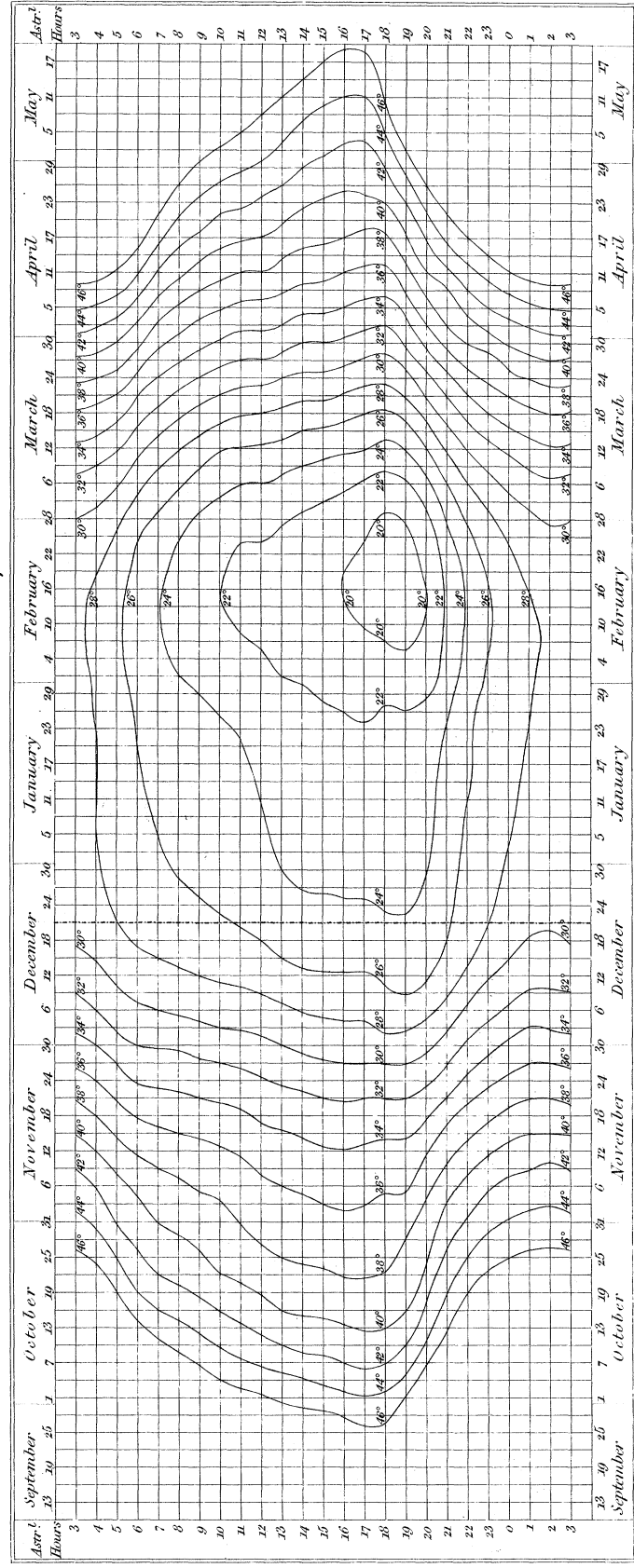
Plate XI. represents the five-day means in the twelve years, both as computed from the monthly means, and as given by the actual averages of every five days; the darker line shows the computed and the fainter line the observed five-day means. The darker line consequently shows the mean march of the temperature, the fainter

line its actual march, and their difference the non-periodic variations for intervals of five days. The monthly means are distinguished by a small circle drawn around the point which marks the temperature; they are connected by faintly dotted vertical lines with the monthly means (similarly distinguished) of the normal temperatures of the latitude of Toronto, derived by DOVE from the mean monthly temperatures of thirty-six equidistant points in each of the parallels of 40° and 50° as shown by his isothermal maps. The normal temperature corresponds to the level of the sea; the temperatures at Toronto are those given directly by the observations, uncorrected for the elevation, which, as already stated, is about 342 feet above the sea.

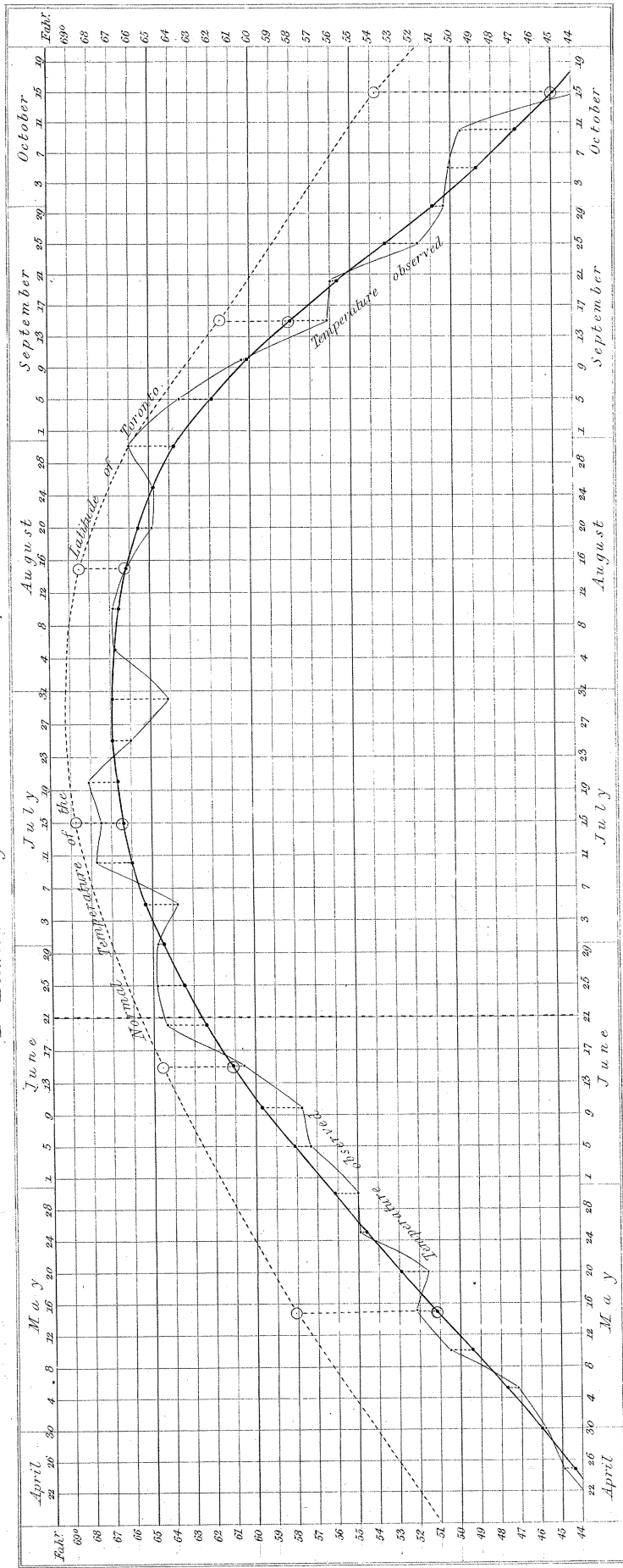
*Chrono-Isothermals at Toronto; derived from six years of hourly observations.
1° Between the highest and the mean Temperature.*



2° Between the lowest and the mean Temperature.



Five-day Means of the Temperature at Toronto from 12 years of Observation.
1° Between the highest and the mean Temperature.



2° Between the lowest and the mean Temperature.

